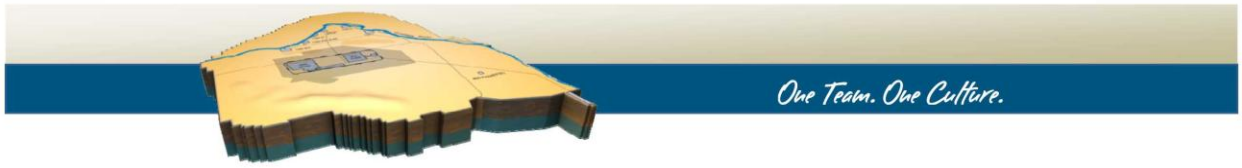

Administrative Procedure

PRC-GD-WKM-12116

Work Planning Guide

Revision 0, Change 4

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Project: CH2M HILL Plateau Remediation Company
Topic: Work Management

Technical Authority: S. J. Gray
Functional Manager: T. D. Jarecki

Administrative Use

CH2MHILL
Plateau Remediation Company

CHANGE SUMMARY

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Description of Change

Rev 0-4
Include section to consider potential work site vehicle hazards and designation of temporary/permanent /equipment parking locations, CR-2010-0160 action #48. The hazard of driving itself was also included. Text has been added to the section on hazard analysis and in Appendix D.
Some clarification in the area of construction (both EPC and subcontractor) and CWPs has been included.
Updated info related to convenience storage and spare parts in section 3.6.
Streamlined and updated the section on environmental review.

REV 0-3 (PRC-09-0984)
Editorial change to replace Interpretive Authority with Technical Authority. Correct Change number in header. Updated procedure references.

REV 0-2
Impacts from : CHPRC *Radiological Control Manual*
PRC-PRO-RP-40108, *Radiological Hazard Screening*
PRC-PRO-RP-40109*, Radiological Hazard Controls for Medium and High Hazard Work*

REV 0-1
Editorial changes to align with current CHPRC procedures format, and reference and form numbers and titles.

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1.0 INTRODUCTION

Developing a complete, efficient work document is fundamental to safe, environmentally protective work execution and supports CH2M HILL Plateau Remediation Company's (CHPRC) Integrated Safety Management System/Environmental Management System (ISMS/EMS) implementation.

1.1 Purpose

This document provides general guidance on how to develop complete and efficient work documents, work instructions, or work packages that can be used to conduct tasks on CHPRC assets. The guide primarily uses the term 'work document'; however, the terms 'work instruction' or 'work package' should be substituted as appropriate.

1.2 Scope

This guidance document is available for employees developing work documents that will be processed through the CHPRC Work Management Process as documented in PRC-PRO-WKM-12115, *Work Management*. Where appropriate, references to documents containing requirements applicable to the planning process have been cited.

1.3 Applicability

This guidance document is applicable to CHPRC employees for developing planned work instructions for work documents that will be processed through the CHPRC Work Management Process as documented in PRC-PRO-WKM-12115. This guide does **not** supersede the requirements in other Plateau Remediation Contract (PRC) documents.

1.4 Implementation

This guide is effective upon publication.

2.0 RESPONSIBILITIES

- The Work Planner (Planner) is responsible to utilize this guide as appropriate for each scope of work assigned to him or her. The Planner facilitates and coordinates the activities and processes that are necessary in order to plan the work so that it can be performed safely, correctly and efficiently, and so that it meets the legal and contractual requirements that apply to the work in the location where it will occur. The work instructions that are developed as an output of the work planning process are used in the field to accomplish work. All planned work instructions utilized at PRC Projects must be prepared or approved by an individual who has completed the Work Planning Qualification Program, course #170723 and *CHPRC Training Completion Record - Work Planner Initial Qualification Card* (A-6005-183).
- Work Control Managers are responsible to ensure the Work Planners at their respective projects obtain the training and experience to perform their work effectively.
- The Work Management Technical Authority is responsible for maintaining work management procedures and the training program for work planners.

3.0 PROCESS

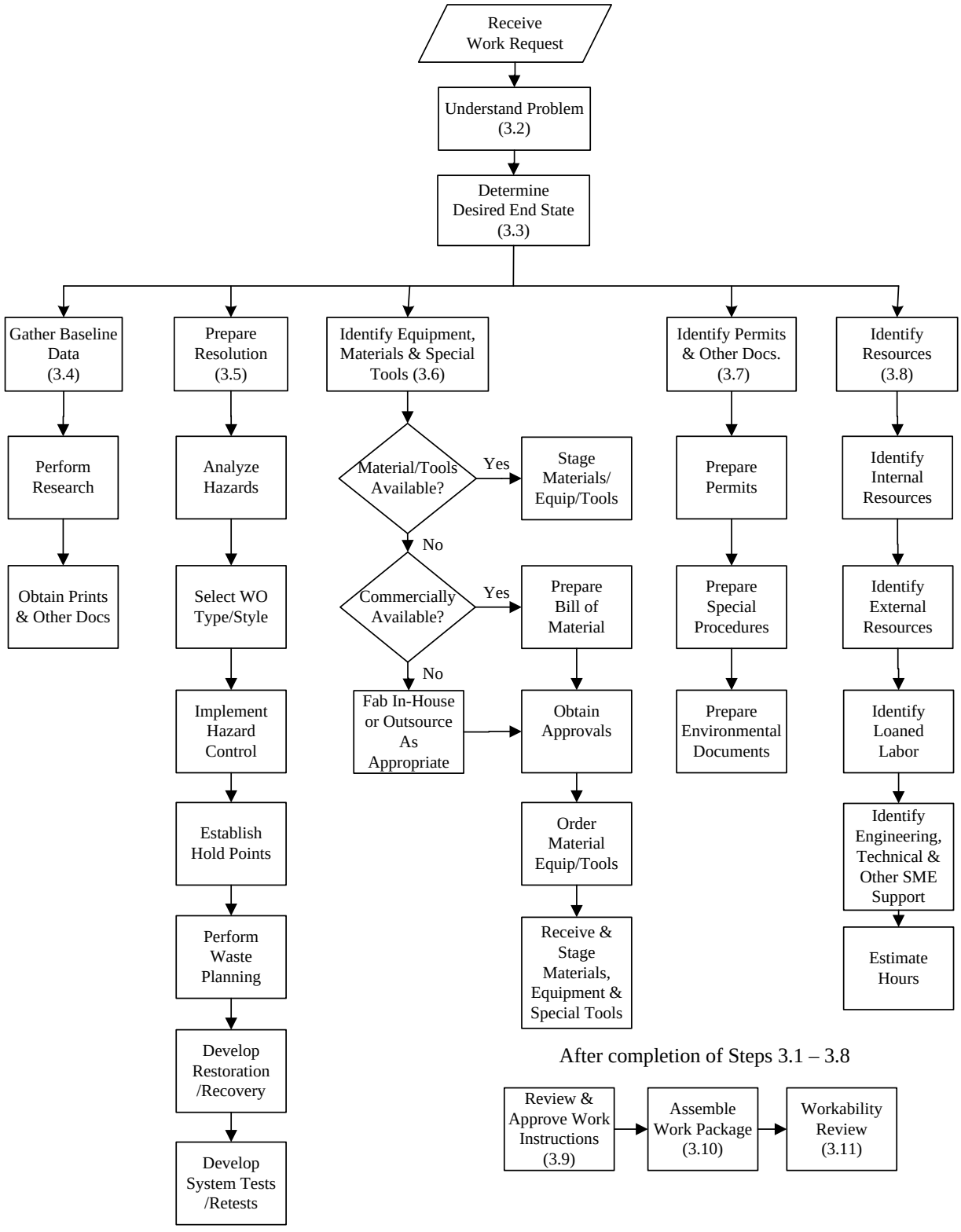
This guidance document addresses the following topics:

- Section 3.1 Introduction
- Section 3.2 Understand the Work scope
- Section 3.3 Determine Desired End-State
- Section 3.4 Gather Baseline Data
- Section 3.5 Prepare Resolution
  - 3.5.1 Hazards Analysis
  - 3.5.2 Work document Style
  - 3.5.3 Planned Work document Types
  - 3.5.4 Work Instructions Format and Contents
- Section 3.6 Identify Needed Materials, Equipment and Special Tools
- Section 3.7 Permits & Other Special Documents
- Section 3.8 Estimating Personnel Resource Requirements
- Section 3.9 Review and Approval
- Section 3.10 Work Package Assembly and Self-Checking
- Section 3.11 Workability Review

3.1 Introduction

The process of planning a resolution for a work document can be relatively straight forward for simple, routine, low-hazard work, or more demanding for complex, high-hazard work. There are many topical areas that should be considered in developing a good work document resolution. These areas are laid out in a logical pattern, i.e., logic tree (see Figure 1). In general, the planning process starts at the top of the tree and works downward. Where there are multiple logic branches, planning typically starts at the left most branch and works towards the right. However, many of the activities involved in the planning process (Sections 3.4 - 3.8) can be done in parallel. As the planning process proceeds, there may be a need to revisit the different logic branches multiple times until the final plan is developed. There is no single logic pattern that is perfect for all planning tasks, and the process must be tailored to the specific work request.

Figure 1 – Logic Tree for Planning Work



3.2 Understanding the Work Scope

A key to writing an effective work document resolution is to clearly understand the problem, workscope or issues identified in the work request. This needed information may be available from several different sources.

1. Read and understand the work request wording.
   - Is there a suspected cause reported?
   - What, if any, troubleshooting was performed and what were the results?
   - Were there any related facility/system activities taking place that could have affected the equipment operation?
2. Review the work control database to determine if similar work scope or symptoms have been previously addressed.
3. If additional information is needed, query the work request originator, operations personnel, engineer or technical authority, facility owner, or craftsmen who may have knowledge of the work scope or equipment.

NOTE: *During this preliminary walkdown, it is beneficial to have field worker and subject matter expert (SME) involvement. This helps provide an understanding of how the work is going to be done and the awareness of the scope to all parties involved in the planning process. Early involvement supports more efficient completion of the remainder of the planning process*

4. Perform a preliminary field walkdown of the equipment or system in question.
5. Review and analyze any available data that may be available, such as log readings, current indications, past equipment history, etc.
6. Determine how this particular work scope fits into the broader picture of the project mission. It may be appropriate to break work up into separate components for ease of planning. However, if this approach is used, hazard control issues still need to be reviewed for the work scope as a whole.

3.3 Determine Desired End State

Work planning is the process of laying out how to get from point A to point B. Point A is the definition of the work scope on a work request or service request, sometimes as modified during an initial walkdown. Point B is the desired end-state that the work document will achieve. The defined end-state may not be achievable via a simple repair or calibration, but could require a redesign, replacement, or even abandonment of the component. Specifying the desired end-state upfront allows the construction of a work document resolution that is more straightforward and efficient.

3.4 Gather Baseline Data

1. At the start of the planning process it is beneficial to gather baseline documents that will support the planning process. Understanding technical design, operation of the equipment, and previous maintenance history is the foundation for a prepared work document. U.S. Department of Energy (DOE) O 210.2, *DOE Corporate Operating Experience Program*, requires DOE and contractor lessons learned be incorporated into work planning and work processes. Typical sources include the following:

   - Previous work history and similar work packages
   - Post Job Reviews
   - Activity Level Feedback Database
   - Lessons Learned– Lessons Learned/Operating Experience (HILLS/OPEX) data base
   - Condition Reporting and Resolution System (CRRS); located on the CHPRC website (Issues Management)
   - Applicable drawings or design media, including, design change notices (DCNs), Facility Modification Packages (FMPs), Work Package Engineering Packet (Configuration Management Package) etc.
   - Nonconformance Reports (NCRs)
   - Certified Vendor Information (CVI)
   - Operations and Maintenance Manuals
   - Other Work Management Documents, as applicable
   - Approved Operating, Maintenance, or Construction procedures
   - Current operating logs and previous preventive maintenance history
   - Photographs of the equipment and general work area
   - Existing Permit data that may apply to the work scope
   - Radiological survey information for the affected work area

2. Other non-document sources that may need to be considered include the following:

   - Personal job-site walkdowns and the use of cameras to take pictures.
   - Discussions with operations/facility/project personnel to determine the symptoms and methods of component failure (i.e., what did it sound like, smell like; what was it doing; equipment or system parameters, etc.).
   - Discussions with Technical Authority (TA) or Operations personnel to determine how the component should behave, obtain guidance on repair/replacement, and to determine required input and approvals.
   - Discussions with regulatory and support organizations (e.g., Environmental, Safety & Health, Radiological Control, Quality Assurance, Nuclear Safety, Fire Protection Engineer, etc.) to determine any specific required controls.

- Discussions with maintenance staff to determine insights on previous maintenance successes and failures with the component and to address workability and efficiency issues. It is beneficial to walk the job down with maintenance staff during these discussions. The identified discussion areas may be addressed individually but, in some cases, it may be more efficient to have an early group Enhanced Work Planning (EWP) session to initiate the planning process. For additional discussion related to EWP, refer to Appendix H, "Enhanced Work Planning Guidance."

3. Davis-Bacon Act Review. Early in the planning process, a key decision needs to be reached on whether the work could be considered "covered work" as described in PRC-PRO-IR-070, *Plant Forces Work Review (Davis-Bacon Act Compliance)*. It is important to make this determination as early as possible. The work is evaluated by submitting a *Plant Forces Work Review* (A-6004-530). See PRC-PRO-IR-070 for guidance on what work needs to be evaluated and the process for conducting the review.

3.5 Prepare Resolution

This section of the planning guide discusses those elements on the logic tree involved with putting together the actual work instructions for the work document. The work instructions are the heart of the work package. The work instructions inform the workers what to do, how to do it correctly and safely, and provide acceptance criteria for that work

To be effective, work packages need to include the following items (from DOE G 430.1-3, *Deactivation Implementation Guide*):

- Description of specific work scope activities
- Identification of the type of hazard analysis required for the activity and verification that the analysis was performed
- Method to ensure that hazards associated with each of the planned activities are evaluated using a hierarchy of controls and documented, and communicated to workers together with the steps to eliminate, minimize, or reduce the risk of those hazards to an acceptable level
- Work permits necessary to conduct such work
- Necessary training requirements to perform each task
- Listing of specialized equipment and each item's intended use
- Personal protective equipment (PPE) needed to limit exposure to the identified hazards
- Emergency response procedures applicable to the task and the area of work
- Description of the management structure, including communication and reporting channels
- Engineering studies applicable to the task
- Expected results upon completion of the task

The detailed work packages provide the details of the work to be accomplished and the process for doing such work safely and efficiently. The work packages also provide the structure of project activities needed to sufficiently inform all involved parties of the work to be accomplished. This documentation ensures that safety and health impacts have been verified and evaluated and that controls are established prior to commencing work.

3.5.1 Hazards Analysis

PRC-PRO-WKM-079, *Job Hazard Analysis*, establishes the requirements for identifying, evaluating, controlling, and communicating potential hazards and environmental impacts relative to the risk and complexity of the work scope. PRC-PRO-WKM-079 also discusses the Automated Job Hazard Analysis (AJHA) tool and contains several links useful to those planning work instructions under "Working References." The EWP team concept outlined in Appendix H, "Enhanced Work Planning Guidance," is recommended for use in conjunction with the Job Hazard Analysis (JHA) process. Appendix M, "Incorporating Hazard Control into Work Instructions," provides guidance on how to incorporate the hazard controls into the work instructions using a graded approach. Depending on the hazard identified, the Planner may need to use other company documents to implement appropriate controls. For example, if the work is a modification and determined to be skill based, an environmental review (*Environmental Activity Screening Form* (EASF) (A-6004-962)) is still required by PRC-PRO-EP-15333, *Environmental Protection Processes*. Types of hazards and implementing documents are discussed in later sections.

NOTE: *PRC-PRO-WKM-079 applies to work performed by CHPRC Team employees involved in CHPRC work scope. Application to CHPRC Team contractors will be as specified or excluded in the statement of work (SOW) or approved safety plan.*

If a standing AJHA exists that might be applicable to the work activity in question, it must be evaluated thoroughly to ensure that it addresses both the hazards of the work activity itself and the hazards associated with the location of the work activity. A standing AJHA could be valid for up to two years, but be cautious to consider whether it addresses changing conditions, and that it contains the most current hazard controls, including those that apply to the location where the work will occur. Consult PRC-PRO-WKM-079.

When using approved procedures, where hazards analysis have been performed, ensure the controls address both the hazards of the work activity itself and the hazards associated with the location of the work activity.

The AJHA is performed with a representative from each craft/work group having a significant role in performing the work. The AJHA output and output from other hazard analysis tools is used as a basis for integrating applicable hazard controls within the work instruction. It is important to note that the application of some controls (e.g., lockout/tagout (LOTO), use of PPE, erection of scaffolding, etc.) may, in some cases, introduce new hazards or risks and may affect decisions about what controls to apply or how best to apply them. This complex integration must not be overlooked during the EWP and AJHA processes.

If a lockout/tagout will be used, the planning team should capture all the hazards that require a tagout boundary (high pressure, electrical energy, chemicals, etc.) as well as any suggestions they have for the tagout boundary locations (valves, breakers, etc.) and the elements or activities that should be included in a "Safe condition check." The team should discuss whether the lock and tag can be implemented before any work begins, or if it must be sequenced in any way with work steps after the package has been released. These suggestions from the planning team could impact the structure of the work instructions, as well as the lockout/tagout performed per DOE-0336, *Hanford Site Lockout/Tagout*.

For any work that requires driving to and from the job site or driving as part of the work activity, the hazard analysis should include the potential hazards involved with the act of driving, especially for workers who are not drivers by jurisdiction. The hazard analysis for this type of work should also include potential hazards at the work site related to vehicle traffic. Controls could include designation of temporary or permanent parking locations for vehicle and equipment, load paths for heavy equipment, identified traffic routes, entry and exit points, exclusion areas, etc.

To successfully lead an AJHA review, it is important that the AJHA session facilitator knows:

- How to be an effective facilitator of the process.
- How to ask probing questions and encourage participation.
- How to effectively use the AJHA software tool, including:
  - Knowing the meaning of the questions being asked.
  - Effectively using subtasks and apply/map hazards and controls to the applicable task. If seven subtasks are not sufficient, consider breaking the work into separate AJHAs.
- About the task prior to convening an AJHA session.

When the EWP process is used, and the AJHA is used with the planning team present, the planning lead should perform several preparatory steps prior to the EWP session. It is important to define the scope before entering the hazard analysis process. These steps include:

- Understand the work scope (see Section 3.2).
- Understand the desired end-state (see Section 3.3).
- Gather baseline data (see Section 3.4)
- Walkdowns the job site to determine surrounding or aggravating hazards or conditions.
- Review Lessons Learned, CRRS, Job Control System (JCS), AJHA, and Activity Level Feedback databases for similar work.
- Develop a rough outline or draft instructions of the steps needed to complete the requested work, including identification of any known or presumed hazards and controls.
- Develop a draft plan for lockout/tagout based on field walkdown, the scope of the work, and the hazards that will require setting a boundary.
- Optimize the approach of the draft plan by considering options in the areas of:
  - Tooling
  - Repair versus replace
  - Radiological As Low As Reasonably Achievable (ALARA)
- Develop an initial needed material list.

The planning and hazard analysis process will go much more smoothly if this homework is done in advance of the EWP session and AJHA session. If scheduling constraints only allow for one meeting to be held, the meeting should clearly focus on scope and then transition to hazards analysis.

The planned work activities must be evaluated against the potential impact to the safety basis of the facility. A safety review is conducted to ensure that the work activities are authorized to be performed within the facility's safety envelope. The formality and rigor of this type of process may vary with the existing hazards or the hazard classification of the project or facility. However, a determination of the impact on the safety basis is essential.

When the scope is understood and the hazards analysis has been completed, the Work Planner must review the proposed work activity against the Hazard Review Board (HRB) screening criteria per PRC-PRO-WKM-40004, *Hazard Review Board*. The JCS has fields that display the screening criteria, and capture that the screening was performed, and whether or not any of the criteria were triggered. If so, the Planner must follow through on the HRB process and inform the HRB Chairperson, provide documents for review, and other actions described in PRC-PRO-WKM- 40004.

3.5.2 Work Document Style

PRC-PRO-WKM-12115 lists three major work document styles that may be used for the different types of work documents. They are:

- Planned Work Document
- No Additional Planning Required Work Document (NPR)
- Minor Work Ticket (MWT)

PRC-PRO-WKM-12115 defines a logical method for selecting the style that provides the right kind of rigor for the type of work to be performed. Planning and No Planning Required styles are used when the tracking and controls that come with using JCS are desired. The MWT is a style that is a single-sheet, paper-only, non-JCS style that is best suited for simple, skill-based, low-hazard work, for which tracking is not required. Recently the MWT was determined to be record material (PRC-PRO-IRM-10588*, Records Management Processes*) despite the nature of the work performed. (Refer to PRC-PRO-WKM-12115, Appendix E, for the criteria to use MWTs). The style selected may be changed during the planning process as appropriate.

This guide primarily deals with the development of planned work instructions, and may be used any time work steps are needed to perform field work.

NOTE: *Some form of hazard analysis is always required in accordance with the graded approach described in PRC-PRO-WKM-079. Skill-based work requires informal analysis performed by the work screener. More complex activities will require a detailed job hazard analysis, usually utilizing the AJHA and possibly Enhanced Work Planning (EWP)*.

3.5.3 Planned Work Document Types

There are six different types of planned work documents:

- Preventive Maintenance (PM) Packages
- Corrective Maintenance (CM) Packages
- Modification Work Packages
- Construction Work Packages (Davis-Bacon covered work)
- Shop Work Packages
- Deactivation and Decommissioning (D&D) or other Plant Support Packages

PM packages include all recurring maintenance items such as equipment calibration, surveillances, and preventive and predictive maintenance. They are typically performed using pre-approved instructions contained within technical procedures and/or JCS datasheets. This broad category of work can also include instrument calibrations and performance of recurring surveillance testing. In preparing PM work packages, it is important to review whether instructions, expected hazards and conditions, references, etc., are still current and accurate, updating instruction, including controls, as necessary. It is also important to ensure that all material identified as being required for performance is available or on order.

CM packages are used to repair existing structures, systems or components (SSCs), using like-for-like repair parts, as determined by the TA, to restore SSCs to original configuration and functionality. CM work packages may also allow for troubleshooting to determine the cause of an SSC failure where the cause is unknown. Refer to Appendix G, "Troubleshooting Process Guide," for supplemental information.

Modification work packages are used to change the existing configuration of SSCs or add new SSCs. Controls and approvals associated with modification work are generally more stringent. (Refer to PRC-PRO-EN-2001, *Facility Modification Package Process*, and PRC-PRO-EN-20050, *Engineering Configuration Management*).

Construction Work Packages (CWP) are for work that has been determined to be covered under the Davis-Bacon Act or "turned-down" work, and will be performed by non-plant forces work crews per instructions generated from work scope outlined in a SOW. The work could be performed by CHPRC Construction per instructions developed specifically for the task and placed in a work package. EPC construction follows all CHPRC procedures. Subcontractors work as directed in their SOW and corresponding work instructions. When this work impacts a facility or interfaces with utilities, detailed work instructions approved by facility representatives may be required to assure the work can be done safely and to provide sufficient control and documentation. Other documents that may clarify the roles and responsibilities between organizations include specifications in a Construction Work Authorization Envelope (CWAE) or Memorandum of Understanding (MOU). Some of the methods and processes used to prepare and control CWPs are unique and are noted throughout this guide. Except where noted, all other guidance in this document applies to CWPs.

Shop Work packages are typically used for such activities as pre-fabrication of equipment prior to installation; assembly or testing of equipment or tools in support of maintenance, plant operations or construction; and housekeeping. Equipment covered by offsite fabrication services contracts are not performed using work packages.

D&D or other Plant Support packages are those packages used to support D&D work or other plant support activities that do not fall under the definition of other work package types. Some of the methods and processes used to prepare and control D&D work packages are unique.

The major mechanism for integrating safety and health into deactivation efforts is the work planning process during which existing safety documentation is reviewed and evaluated, deactivation activities are identified and evaluated against existing controls, and modifications to controls are identified as required by the new activities. Worker involvement in all levels of safety/hazards analyses required for the planning and execution of deactivation tasks is key to making all elements of deactivation efficient and satisfactory (DOE G 430.1-3, *Deactivation Implementation Guide*).

3.5.4 Work Instructions Format and Contents

It is recommended that the standard format provided below be used as an outline for all planned work instructions to ensure a level of consistency for those reviewing or performing work. Those sections that are appropriate to the particular work document should be included; others may be identified as non-applicable (N/A) (preferred) or omitted with the section numbers changed to reflect their deletion. Those sections marked below by an asterisk should be considered the minimum required sections for planned work packages. A work instruction template is provided for optional use at Appendix K, "Work Instructions Template Example."

- 1.0 *Scope
- 2.0 References (may be captured in JCS instead of work instructions)
- 3.0 Materials, Special Tools and Equipment
- 4.0 Precautions and Limitations
- 5.0 *Prerequisites
- 6.0 *Work Steps
- 7.0 *Restoration & Testing* (or, "as left" summary for D&D work
- 8.0 Startup Activities and Turnover (only used for calibration, grooming, and alignment [CG&A], new construction, etc.)

The work instruction preparer (for planned work packages) has the responsibility to ensure that work is planned safely, correctly, and as efficiently as possible. The work instructions should be appropriate to the work requested, the location where the work will occur, and any associated risks or hazards. The goal should always be to use the simplest approach that provides adequate instructions to get the work accomplished safely and compliantly. The structure of the work document is tailored with the goal of keeping instructions simple, to the point, and using a level of detail that is commensurate with the skill of the workers and the need to include specific hazard controls. Each section of the work document should contain information appropriate to the level of complexity of the task and any associated risks or hazards. See Appendix A, "Example Work Instruction Checklist," and Appendix K, "Work Instructions Template Example," for additional information.

a. Scope

Describe the work to be done with sufficient detail to enable understanding of the overall task. The scope should address the work scope description and the defined end-state to be accomplished. The scope should also simply state any planning boundaries or assumptions related to Environmental, Safety, and Health; e.g., "planned for summer time work inside a contamination area using hand held tool."

- A well-defined work scope is critical to the successful development and execution of a work package. Effective development of scope for an activity is essential for proper hazard identification, analysis and mitigation.
- Work Package Scope should not be confused with the work instructions needed for the supervisor and workers to execute the activity. A work package may contain a substantial amount of scope definition to support hazard identification yet only have a few steps to execute the activity, particularly if the workers have trained, practiced or performed the activity multiple times.

- The type of information that should be considered in defining the scope includes the following:
  - Purpose and type of activity or work being performed
  - Starting points, ending points, and boundaries
  - Critical tasks being performed and principal types of hazards directly involved or expected to be encountered, especially unique hazards (e.g., demolition, plasma arc cutting, hydrolasing, etc.)
  - Closely associated/located systems or components that are not part of the scope
  - Recognition of other co-located or concurrent work activities that may be ongoing at the time of the job
  - Significant uncertainties that exist that could affect the performance of the activity
  - History of the activity performance, including records, process knowledge, etc.
  - Environmental or regulatory impacts that could occur as a result of the work
  - Any special techniques or tools that will be used that introduce their own hazards, or that might challenge facility or site authorization bases
- The more uncertainty and hazards that exist with an activity, the more rigor and analysis is required in the planning phase. The defined scope can vary from simple paragraph for repetitive routine activities (e.g., instrument calibration, breaker maintenance, lagging removal, waste packaging) to a page or two for complex or high-risk activities that involve multiple work groups and significant coordination. The full work scope should be characterized as completely as possible before developing the technical requirements and performing the hazard assessment. It is recognized that scope might change as technical requirements are developed, walkdowns are performed, and hazards are analyzed.

Some tasks will have a very limited scope, and therefore the full scope is understood as soon as the work task is identified. Other tasks are complex and involve numerous actions, work groups and planning meetings. For these complex tasks, determining the scope of work may be an iterative process throughout the work instruction development.

b. References

The work instruction References section should refer to those documents that are called out by the work instructions for work to be performed or to aid in work to be performed. It should not list every document, checklist, log, etc. contained in the work package or used to develop the work package/instructions. Instead, if JCS is being used to prepare the work document, use the JCS references tab to compile a complete list contained in the work package (e.g., Radiological Work Permits, Environmental Permits, screening checklists, drawings, FMPs, procedures, NCRs, etc.). This allows for easy identification and review of the documents prior to work performance. Documents not needed for the field work should be listed in the Reference Documents section in the work resolution or JCS as “Info Only.”

Only documents necessary to complete the task need to be placed in the field work package. Documents identified as “information only” or only used to help prepare the work, but not needed for the performance of the work may be held separately in a file and rejoined with the field work package upon completion of the field work and before the work package is sent to Records Holding. Facilities and projects that choose to separate and rejoin the work package should designate who is responsible for the administration of those actions.

In those cases in which the PRC-PRO-WKM-079 hazards analysis process leads to a determination that the work is skill-based, the reference section of the work instructions and/or the JCS work document may be used to state “Skill-based Work” in lieu of citing an AJHA document number. JCS provides specific fields for the skill-based determination and the AJHA number; use them.

c. Materials, Special Tools and Equipment

Material necessary to perform the work should be identified, along with any special code requirements, and the necessary documents to provide traceability; include the required documentation in the final work package. If material is not specifically purchased for the work task, the source from which it is to be obtained (e.g., shop stock, etc.) should be clearly identified. If all needed materials are identified on a Bill of Material (eBOM), that fact should be noted in this section and a printout of the eBOM is included in the work package. Re-listing all the materials in this section is not required in this case. Additional information on processing an eBOM or other procurement/ material issues may be obtained by visiting the PRC Supply Chain Management web site.

It is prudent to include a statement to return unused parts and material to appropriate locations upon job completion.

Special tools should be identified in this section to aid in equipment acquisition efforts before the work package is released. Common hand tools and equipment need not be listed. Where a special piece of measuring and test equipment (M&TE) is required, identify the type and range of M&TE and acceptable equivalents. Include provisions in this section or in the Instruction Section to record calibration data (serial number and calibration date). PRC-PRO-MN-490, *Calibration Management Program*, provides guidance on recording calibration data for M&TE.

d. Precautions and Limitations

Identify any precautions or limitations that apply to the work instruction activity. Use of the AJHA software may identify potential hazards directly or direct the use of other controlling documents (request a Cultural Resource and/or Ecological Resource Review, as applicable) that may identify other precautions and limitations. The Enhanced Work Planning (EWP) process is also valuable in ensuring that everyone fully understands the job from different perspectives and that any work interfaces, necessary precautions, limiting conditions, and/or contingency planning are appropriately addressed. See Appendix M, “Incorporating Hazard Controls into Work Instructions,” for guidelines on how and where to incorporate the controls for identified hazards into the work instructions.

It is a good practice to cite the source of the various controls and limitations. This can be done by including a parenthetical annotation at the end of the control or precaution. For example, “(AMW)” could be cited for an item that was the result of the *CHPRC ALARA Management Worksheet (AMW)* (A-6004-634). This is helpful during review and approval, and also helps ensure that hazard control changes are approved by the SME organization that originally required them. Controls have been inadvertently removed in the past when a reviewer did not realize why the control had been inserted.

- Industrial Safety & Health. List potential hazards associated with the job and its location, and provide guidance (controls or personal protective equipment) for dealing with such hazards. The controls should be included in the work instructions at the appropriate location, using the guidance of Appendix M. Provide material safety datasheets (MSDS) for those chemicals that are new or infrequently used by the workers. It is a good practice to include the AJHA in the package for reference, but inappropriate to send the workers to the AJHA for information they need to work safely.

- Weather. Consider potential weather impacts on the work and any limitations or controls that may be necessary under changing conditions. Keep in mind that schedules often shift, and instructions written for one weather condition might actually take place in very different conditions. State any assumptions made about weather conditions in this section so that when the work is scheduled any anomalies can be readily identified and resolved.

- Radiological Conditions. Due to the nature and history of the Hanford Site, all work should initially be evaluated as radiological work and be presented to the Radiation Protection organization for radiological hazard screening, except when the work sponsor can verify that all of the conditions specified for nonradiological work in CHPRC-00073, *CHPRC Radiological Control Manual*, "Glossary," are met. Consult a qualified Radiological Work Planner, and together consider whether there is a potential for changing radiological conditions and if such changes would impact work (e.g., work to be performed only under non-Airborne Radioactive Area conditions). Based on the analysis of radiological hazards/risks and any potential for changing radiological conditions, clearly define the prerequisites, precautions and limitations, radiological controls, radiological monitoring, hold point(s), inspection, or training as appropriate.

- Equipment and Work Status Notifications. Include statements as necessary to ensure the Operations group or Building Administrator is notified of any planned or actual changes in the status as requested by them, or when there is an abnormal or upset condition, including incorrect performance of work instructions. This could also apply to Building Administrator responsibilities in buildings or work locations that are not under an Operations group.

- Safety Basis and Other Operability Requirements. Facility operability requirements (safety class, safety significant, technical safety requirement (TSR), environmental and effluent monitoring, fire system requirements, etc.) may contain action statements based on the length of time the system is inoperable. When these time clocks exist, it is important to note the time the system is rendered inoperable for maintenance and then restored to an operable condition. It is a good practice to include both the step number at which the system will be made inoperable and the step number in which the system is restored to operable status in the Precaution and Limitation section where the TSR or other operational limit is discussed. Additionally, within the work steps (Instructions), it may be prudent to include a place to record the exact time a system was rendered inoperable and the time restored to service when time constraints exist for the work being done. This practice of tracking system operability will assist Operations in carrying out action statement requirements.

- Facility Configuration Management. Consult with Operations to determine whether it is appropriate to include information about equipment operability, such as a minimum number of units that must be operable in certain plant conditions, or similar.

- Limiting Conditions for Operation (LCO). Clearly reference any specific LCO action statements or requirements that apply. Some facilities use additional guidance for their circumstances; for instance, at the Plutonium Finishing Plant (PFP), TSR requirements are incorporated in accordance with FSP-PFP-5-8, *Technical Safety Requirement Compliance*, Section 13.3.

e. Prerequisites

This section is intended to be used to identify those actions that must be performed or conditions that must be verified before the work steps may begin. It may contain activities to be performed by both Operations and the work team, and the steps be grouped by area of responsibility.

The Release Authority is required to ensure that all Operations or Release Authority prerequisite steps have been completed prior to formal work release. Therefore, if a prerequisite only applies to a particular step or set of steps, that control should normally be in the body of the work instructions and not the Prerequisites section. If the work document will be released in sections (partial release), it is also acceptable to tailor the prerequisites with additional instructions to lineup with how the work will be released. Variations are allowed if the intent can be clearly stated to both Operations and the field work team.

Careful consideration should be given to the placement of this information within the procedure in order to help ensure that the intent of the instructions is understood. The FWS and work team are responsible to follow the work instructions.

Examples of prerequisite steps for Operations or the Release Authority (these must be completed before full work package release):

- Establish required equipment/system lineups.
- Establish conditions related to Safety Basis constraints; formally declare entry into an LCO, start a clock related to the DSA, etc.
- Establish required energy boundaries via lockout/tagout if the boundary will be in place for the entire job. Lockout/tagout boundaries may be altered within the body of the work instructions when only certain portions of the work require control of hazardous energy or the boundary changes during the work. See bullet f, “Work Steps,” below or PRC-PRO-WKM-12115, Section 3.2.3.14 and following for more details.
- Provide a signoff for any/all prerequisites if formal verification of completion is desired (alternatively, this may be done via a step/entry at the start of the Work Steps section).
- Identify special permits or conditions needed to perform the work that impact facility safety basis, equipment configuration, etc.

Examples of prerequisite steps for the Field Work Team (these may require a partial release if field work is required and Release Authority (RA) cannot issue a full release because the Operations prerequisites are not complete).

- Identify recommended pre-work fabrication or shop work activities.
- Ensure tools and materials are available and staged for the work.

- Establish the work area boundaries and prepare the work area (e.g., work boundary barriers, waste and material receptacles, entry/exit control points, material staging areas).
- Identify any special training or qualifications needed by members of the work team to conduct the work.
- Identify special permits or conditions needed to perform the work related to equipment, materials, building scaffolding, etc.

f. Work Steps

The level of detail in work instructions should reflect a graded approach. For routine and simple tasks, this can be done with one or two steps. For more complex work, the hazards and their associated controls, the impacts on the facility, and the appropriate amount of technical information need to be reflected in the work instructions. Ultimately, the work steps need to be written so that the work can be performed safely, correctly, and efficiently by those that will actually be performing the tasks. The intended audience is the field work team.

Certain standards for good technical writing practices have been developed to help ensure that instructions can be followed with a minimum of errors. The following points should be followed in developing written work instructions whenever possible. Appendices and attachments are provided that provide additional guidance on many of the following:

- Technical procedures should list those documents required "in hand" for actual procedure performance.
- Instructions should be clear and precise.
- Each step should contain only one action.
- The nomenclature used within the procedure to identify equipment (such as equipment type, facility designation) should be identical to the nomenclature (if available) on the equipment actually installed.
- Procedure should be written to minimize risk to the public, worker, the environment, and equipment.
- Where potential hazards exist, adequate warning or caution statements should be provided in the procedure.
- Warnings, Notes, Cautions, and criticality statements should be easily identifiable and do not contain action statements.
- Warnings, Notes, Cautions, and criticality statements precede the step to which they apply.
- Warnings, Notes, Cautions, and criticality statements should appear on the same page as the step to which they apply.
- The procedure should be written to the degree of detail necessary for safely performing the required activity.
- Signoff blanks should be provided for selected critical steps.
- Independent verification signoff should be provided for applicable steps or sections of a procedure when required.
- Acceptance criteria and/or other requirements within the procedure should be clearly stated so the user can easily determine if the results are within the acceptable range.

- Vendor information (technical manuals, drawings, etc.) should be reviewed to ensure all necessary technical requirements are included in the procedure.
- ALARA principles should be considered when writing or revising the procedure. ALARA principles applying to hazardous material, hazardous waste, chemicals, and radiological contamination shall be considered.
- Applicable radiological hold and survey points should be identified.
- RWPs contain entry, dosimetry, PPE and minimum radiological coverage requirements; any work steps should be contained within the work instructions and not on the RWP.
- Technical Specifications (TSs), TSRs (formerly Operational Safety Requirements [OSRs]), and all other applicable requirements or limits should be identified.

Continuous Use. All planned work instructions will be considered Continuous Use per the definition in PRC-PRO-MS-589, *CH2M HILL Plateau Remediation Company Procedures*. Resequencing of steps or sections is not permitted unless authorized by the procedure. (Steps are defined as those actions identified in the performance section of the document.) If the technical work instructions are in the form of an approved procedure developed per PRC-PRO-MS-589, then the procedure use type, as marked on the procedure, is appropriate while performing the work. If sections of a procedure have been blocked and copied into planned work instructions, the instructions are Continuous Use, even if the donating procedure was marked with another designation per PRC-PRO-MS-589.

Flexibility within continuous use instructions is possible if, as allowed per PRC-PRO-MS-589, the resequencing is authorized within the work instructions. This can be done by inserting a note at the appropriate step within the work steps or prior to the task/section as applicable (see Figures 2 and 3). The note shall be used to specify boundaries of flexibility within the work steps. Clarify which steps may be worked out of order or repeated if the note does not apply to the entire section, task, or work instruction.

Blanket flexibility, as used in Figure 3 should never be applied to work instructions in their entirely unless it is true that all steps may be done in any order without impact to worker safety, to technical aspects of the work activity, to the environment, or to facility configuration.

Figure 2. Example of Blanket Flexibility Statement (use with extreme caution)

> ***NOTE***: These work instructions are Reference Use. It is expected that the general sequence of these work instructions be followed; however sections or steps may be repeated, performed in parallel or out-of-sequence as determined by the Field Work Supervisor (FWS) unless specifically noted otherwise within the instructions. All Warnings, Cautions, Hold Points, Witness, Verification or other control points must be strictly adhered to

Figure 3. Examples of Properly Bounded Flexibility Statements

> **NOTE**: Section 6.1 must be completed before any other section may begin. Section 6.2 through 6.5 may be performed in parallel, but the steps within each section must be performed in the order written. Section 6.6 may begin after sections 6.2 through 6.5 are all complete. The remaining sections must be performed in the order written.

> **NOTE**: Steps within this section may be performed in any order or in parallel. The FWS may N/A steps that do not need to be performed.

These notes stating flexibility do not automatically give permission to omit steps without going through the change process stated in PRC-PRO-WKM-12115. If it is desired to give the FWS authority to "N/A" certain steps, the criteria shall be stated within the approved work instructions, as in the last example of Figure 3.

When developing work instructions intended to be performed with flexibility, be particularly cautious if the work instructions also direct a change in the LOTO boundary during the course of the work. Flexibility plus LOTO changes are precursors to injury; the work planning team must ask and answer the Human Performance Initiative (HPI) questions carefully and insert appropriate safeguards within the work instructions to prevent an event from occurring.

Consult PRC-PRO-MS-589 for more information on procedure use types.

Format. Use the mechanisms of numbering or bulleting steps wisely. Steps that are numbered or alphabetized should be followed in sequence unless otherwise specified (required for step-by-step instructions). Bulleted steps within a section may be performed in any logical sequence, even in step-by-step instructions.

Where precise following of work steps is critical, consideration should be given to use of check boxes, blanks to initial, or other means of keeping track of which steps have been completed. Similar means may also be used to keep track of repeated work steps for multiple components.

"Nesting" or indenting of work step sections (see examples below) may be used to improve readability and understanding of work steps. Using more than three levels of indenting should be avoided. The use of automatic paragraph numbering may be used to provide consistency, and ease of preparation and revision of work packages.

Example 1	***Example 2***
6.0	***6.0***
6.1	**6.1**
6.1.1	**6.1.a**
6.1.2	**6.1.b**
6.1.2.1	**6.1.b.a)**
6.1.2.2	**6.1.b.b)**
6.1.2.3	**6.1.b.c)**
6.2	**6.2**
6.3	**6.3**

- Vectoring. Vectoring is the practice of referring the reader to different locations for instructions and requirements. Vectoring can cause the reader to lose track of where they are in the work instructions and miss steps. To the extent possible, vectoring should be avoided and work instructions written to include all steps necessary for the worker to perform in the order that they need to be performed for safe, compliant, and efficient execution.
- Language. Use clear language and instructions. Avoid the use of confusing phrases, unfamiliar jargon or acronyms, and double negatives. All steps should contain a straightforward, positive action statement. Leave negative statements for Warnings and Cautions only.
- The use of vague phrases in the detailed work instructions should be avoided. Vague phrases include terms like "per FWS," "per Engineering direction," "when appropriate," "as required," "when applicable," etc. Although there may be instances where such terms are needed and appropriate, they require the field team to interpret what was intended when the work instructions were developed. These interpretations may result in outcomes that are different than those intended by those who developed or approved the work instructions.
- Changing lockout/tagout boundaries. If the safe work boundary (LOTO) is to be implemented incrementally or altered during performance of the work, consult with the Release Authority (RA) to determine the most appropriate means to ensure that the RA is involved with integration of the work and the safe boundary changes. Verify the work instructions provide adequate structure to ensure that the isolation boundaries are clearly defined in each configuration change, or the RA controls authorization utilizing partial work release.

- Technical Information. Information that should be considered for inclusion in work steps for technical subject matter is provided in Appendix D, "Work Instruction Topical Information Guidance." Ensure the TA has specified all technical requirements pertinent to work.
- Before implementing any formal test procedure, any hoses, tools, or other temporary testing equipment should be verified operable, calibrated, or inspected and in good condition to ensure that they function as expected during the test. These verifications should be identified before the test begins or in the prerequisite section, with completion signoffs required.
- Hold Points (requiring independent verification and/or approval) should be clearly delineated.
- Warnings, Cautions and Notes. It is recommended that a consistent format for Warnings, Cautions and Notes be used. To help ensure the appropriate use of Warnings, Cautions and Notes, DOE-STD-1029-92, *Writer's Guide for Technical Procedures*, may be referred to for standard definitions.
    - No action steps are to be included in Warnings, Cautions, or Notes.
    - Warnings, cautions and notes should be on the same page as the step to which they refer.
    - Warnings, cautions, and notes precede the step.
        - Warnings are to call attention to steps that, if not performed correctly, could adversely affect personnel safety or health, or the off-site environment.
        - Cautions are to call attention to steps that could result in damage to equipment or adversely affect equipment or system operations.
        - Notes call attention to important supplemental information.

See also the guidance in Appendix M.

g. Restoration & Testing (or "as left" for D&D work)

Restoration and testing includes those activities necessary to ensure that SSCs are functioning as required at the completion of the work activity. It also includes actions necessary to safely remove lockout/tagout, restore system configuration, properly dispose of waste, direct return of unused material, and other housekeeping activities as needed to clean up and restore the work area.

Testing is used to determine the acceptability of the work. Equipment and/or systems should be tested after modifications or repairs to ensure continued capability to fulfill design requirements. Planners and Design Authority (DA)/TAs need to verify that any retest instructions within an FMP are contained in the work instructions to ensure that the work team does not overlook them. Refer to PRC-PRO-NS-062, *Unresolved Safety Questions*, which states that post-modification testing should be considered and included in the USQ system for the modification.

Sometimes the DA will include retest requirements on the FMP. Planners should check the FMP, and, if retest instructions have been included, ensure this is included in the work instructions so that it is not overlooked at the conclusion of the field work.

For Hazard Category 2 or 3 nuclear facilities, tests required to verify conformance of an item or computer program to specified requirements, or to demonstrate satisfactory performance for service shall be planned and executed. Characteristics to be tested and test methods to be employed shall be specified. Test results shall be documented and their conformance with test requirements.

National Electric Code (NEC) inspection must be completed prior to energization of new or modified electrical SSCs per PRC-RD-SH-11827, *Hanford Electrical Safety Program Requirements*. A signoff should be included as appropriate.

At a high level, a retest is performed on all work, whether performed as a Minor Work Ticket, modification, periodic maintenance, or corrective maintenance. It may be as simple as the implied tests that are completed when performing a service request to ensure proper functionality, or as complex as a detailed test placed in a planned corrective maintenance or modification work package. The craftsman typically does component tests; system function tests are typically performed by the Operations group.

For acceptance testing requirements for new and modified SSCs, refer to PRC-PRO-EN-286, *Testing of Equipment and Systems*. Operations and maintenance testing is not included in the scope of PRC-PRO-EN-286; however, the procedure may be referred to for guidance. PRC-PRO-QA-283, *Control of Inspections* provides additional requirements related to in-process and final inspections. The TA is ultimately responsible for defining the acceptance and testing requirements appropriate for the task being performed.

For D&D work, a more practical application of this section would be to include a summary of the "as left" condition of the system or equipment.

h. Startup Activities and Turnover

This section is used to document:

- Formal turnover activities, including acceptance or operational testing, turnover checklists, etc. at the completion of construction work where SSCs are turned over to the operating entity.
- Turnover of SSCs from Maintenance to Operations at the completion of maintenance activities.
- If a Modification Impact Review Form (MIR) was associated with the work, consideration should be given to providing documentation that any MIR requirements designated by Operations as required pre-turnover have been verified complete.

Review and acceptance of work should be documented by Operations Acceptance signature, as appropriate.

If during the preparation of the instructions it becomes apparent that the work will trigger a formal post-job review, consider whether it is appropriate to place a step calling out that meeting. This will also be valuable information when scheduling resources. Consult PRC-PRO-WKM-14047, *Pre-Job Briefings and Post-Job Reviews*, for requirements.

3.6 Identify Needed Materials, Equipment and Special Tools

Acquisition of the necessary materials required to conduct a task can be a long-lead item in the work planning process. The materials may be obtained from one of many avenues. Existing equipment and material stocks should always be checked (including at other facilities) prior to ordering new materials. Material Coordinators can help search for on-hand materials, including available spares. A Plant Forces Work Review may be required. Common sources and links to the controlling company documents are as follows:

- Convenience Storage - Material stored in the warehouses for future use. See MSC-PRO-140, *Utilizing General Supplies, Spare Parts, and Convenience Storage Inventories*.
- Fabricated Item - Materials that are made to customer designs by shops or outside contractors are requested for fabrication through the appropriate entity. Items that are covered on a statement of work (SOW) may be requested on a Fabrication Request form . Some fabrication may be performed by CHPRC crafts, and some must be performed by other Hanford companies.
- Measuring and Test Equipment (M&TE) - If M&TE needs to be purchased, this should be performed early so the necessary calibration activity can be accomplished before the tool is needed to support fieldwork. Efforts should be made to ensure that the needed M&TE, or a suitable substitute, is not available at other Hanford facilities prior to purchasing new. M&TE custodians have available points of contact (POCs) to assist in this search.
- New Material - Material that must be ordered from offsite sources through the procurement system. See PRC-PRO-AC-123, *Requesting Materials and Services*, and PRC-PRO-AC-335, *Use and Control of Purchasing Card* (P-Card).
- Shop Stock - Material typically maintained for routine maintenance activities. Controlled locally at the facility, usually in one or more central storage locations, including bench stock.
- Spare Parts - Items identified by the TA as necessary for maintaining the system. See PRC-PRO-EN-129, *Controlling Spare Parts Inventory*.
- Spare Part Status - The Central Engineering Spare Parts POC has several reports that can be used to identify status of materials in spare parts. These reports can be accessed through the Engineering web page and the Spare Parts Topic. Direct questions via email to ^Spare Parts-CHPRC.
- Special Tools - These may be newly purchased, borrowed, or fabricated tools at a CHPRC or commercial fabrications shop. If the tools require any kind of M&TE calibration, the need for acquisition of the tool should be identified and started early so the necessary calibration activity can be accomplished before the tool is needed to support fieldwork.

Traffic Elements – construction and designation of parking in accordance with State regulations, signage, etc.

Work with the DA/TA to determine material requirements for the work document and submit an eBOM to the Material Coordinator for processing. Additional information on processing an eBOM or other procurement/material issues may be obtained by visiting the PRC Procurement web site.

3.7 Permits and Other Special Documents

Permits

Some work activities require the use of a permit to allow the work to proceed. The permits specify additional controls that must be followed during the performance of the work. It should be considered whether it is appropriate to restate any controls required by a permit within the work steps (see Vectoring).

The processing of the permits should begin early in the planning process so the permits are available when the work document is approved.

In some cases, revisions, exemptions, or waivers to existing facility or company environmental permits may be needed, requiring review and approval by external regulatory bodies. These will be identified as part of the environmental review and, if needed, will require significantly more time to process. Before starting any demolition or renovation activities, contact the cognizant Environmental Compliance Officer (ECO) to determine if the activities require submittal of a Notification of Intent (NOI) to the Benton Clean Air Authority (BCAA).

Activities affecting the facility safety basis, although not governed by a permit, may require review and approval by DOE. This will be determined through Nuclear Safety (Unreviewed Safety Question) review. Additional time should be allowed for accommodating any required DOE reviews.

The types of activities that require permits are as follows:

- Asbestos Work – See PRC-RD-SH-15097, *Asbestos Control - Construction Industry*, for guidance on conducting asbestos work requiring permits.
- Confined Space Entry – See PRC-RD-SH-11258, *Confined Spaces*, for guidance on making confined space entry work requiring permits.
- Energized Electrical Work – See PRC-RD-SH-11827 for guidance on conducting energized electrical work.
- Environmental Permits - See PRC-PRO-EP-15333, *Environmental Protection Processes*, for guidance on activities requiring an environmental permit modification, Department of Health Notice of Construction (NOC), Ecology Air Permit, or other environmental permits. Before starting any demolition or renovation activities, contact the cognizant ECO to determine if the activities require submittal of an NOI to the BCAA.
- Excavation Work – See PRC-PRO-SH-090, *Excavating, Trenching, and Shoring*, for guidance on excavation activities.
- Hanford Fire Marshal – See HNF-RD-8589, *Hanford Fire Marshal Permits*, for guidance on activities requiring a Hanford Fire Marshal Permit. Fire Marshal Permits are required for a variety of activities that might not be apparent, such as chemicals greater than a certain amount, storage of compressed gas, occupancy and outdoor burning, as well as more obvious topics such as explosives, flammable and combustible liquids, and fire hydrants.
- Hotwork Permit – See MSC-RD-9900, *Hot Work Performance Requirements*, for guidance on hot work permits.
- Non-Emergency Hydrant Tie-In Permit – See MSC-RD-9717, *Fire Prevention for Construction/Occupancy/Demolition Activities*, for guidance on fire hydrant tie-in permits.

- Pole Contact Permit – See MSC-PRO-479, *Pole Contact Permits*, for guidance on attaching items to electrical poles.
- *Pre-Demolition Checklist* (A-6004-622) – See PRC-PRO-WKM-12115, *Work Management*, Appendix K for activities related to building or system demolition.
- Radiological Work – See CHPRC-00073, CHPRC *Radiological Control Manual*, for definition of radiological work, and for requirements related to radiological work planning and Radiological Work Permits, and the possibility of a *CHPRC ALARA Management Worksheet (AMW)* (A-6004-634).
- Water Service Tie-Ins - Contact the Water Utilities organization for guidance on how to fill out the On-Site Sewage System Tie-In/Use Permit for both sewer and potable water system changes. See MSC-PRO-27075, *Hanford site Public Water System Tie-In*.

Other Special Documents

Other special documents may be needed in support of work instructions. These could include, but are not limited to test plans, startup, or turnover checklists, pre-approved procedures, vendor-supplied instructions, etc. These are documents that will directly support the work and may contain instructions that need to be performed, but are referenced for performance by the work instructions, rather than being written into the work instructions. These documents may already exist or may need to be prepared by the cognizant TA.

3.8 Estimating Personnel Resource Requirements

The resources needed to perform the work may be specified in the work document and/or JCS. The resources may come from those regularly assigned to the facility/project, acquired from within the company, or brought in from other companies or contractors. Estimate hours and the number of individuals for each of the resources to assist the scheduling process.

In addition to estimating the time required consideration should be given to training and special qualifications needed to conduct the work. If there are special requirements above and beyond normal training requirements for working at the facility/project that are not specified in the RWPs and other permits for the work task, then they should be called out in the Precautions and Limitations, or in rare cases, the Prerequisites section of the work document and be identified in the work instruction when required. This is to ensure that properly trained staff conducts the work.

Resource estimates should also include the time necessary to perform table-tops reviews or mock-ups that are considered necessary to ensure that the workers have the appropriate knowledge, skills, and abilities to perform the activity safely and correctly.

3.9 Review and Approval Process

PRC-PRO-WKM-12115, Appendix L, "Review and Approval of Work Management Documents," establishes the minimum review and approval requirements for work documents prepared in support of mission activities. The DA or TA has the responsibility to approve the work documents and ensure the necessary review and concurrence is obtained from the appropriate organizations. Some facilities may require additional reviews or trigger reviews at a more restrictive level than stated in PRC-PRO-WKM-12115, Appendix L. The TA/DA is responsible to consult facility-specific documents to ensure that all required reviews or approvals have been designated.

If changes are made to the work instruction during the review and approval process, the individuals who have already reviewed or approved the document must be informed of the changes and given the opportunity to review the document again.

Environmental Review. All work must be reviewed for environmental compliance. Processes to ensure CHPRC compliance with all environmental law have been identified in PRC-PRO-EP-15333, *Environmental Protection Processes*. It should be noted that all construction or modification, and closure and deactivation/ decommissioning work documents are required by PRC-PRO-EP-15333 to have an environmental screening to ensure compliance with all applicable environmental laws, and applicable cultural/ historical and ecological resources reviews to ensure the work is covered by appropriate environmental documentation. Associated and applicable reviews should be recorded and kept with the environmental documentation for the proposed activities. The National Environmental Policy Act, NEPA, applies to all work on the Hanford site that isn't covered by another Act. Acts that could apply are addressed in PRC-PRO-EP-15333 (or it references the appropriate procedure) and the work documents are reviewed by the ECO to ensure the work is performed compliantly.

Review of work documents is performed and documented in one of three ways: using the *Environmental Activity Screening Form* (EASF) (A-6004-962), the formal AJHA process, or for work to which NEPA applies, there is a third means. If the Work Planner has taken the appropriate two-day NEPA training (course #170130) and is authorized in writing by the ECO to conduct the NEPA screening, the Planner may apply the appropriate sitewide categorical exclusion (SWCX) and document it on the work document. In this case, a separate ECO signature for the NEPA review is not needed. Otherwise, the Work Planners must coordinate with the respective ECO or Environmental Group that provides support to that project for assistance in completing the NEPA review and documentation, as indicated in PRC-PRO-EP-15333.

It is important to identify and arrange for the environmental support resources appropriate to the need early in the planning process because of the long lead time that can be involved in obtaining outside agency approvals for some permits/activities. Work that will have the potential to generate uncontrolled airborne radioactive contamination, or that discharges liquids to the soil must be reviewed for compliance. Excavation activities may require a cultural/ historical and/or ecological resources review. Activities that cause waste generation and/or waste designation must be reviewed for compliance. In all of these examples, contact the facility ECO or Environmental Group for the appropriate environmental review. See PRC-PRO-EP-15333 for instruction regarding the specific activity.

Before starting any demolition or renovation activities, contact the cognizant ECO to determine if the activities require submittal of a NOI to the BCAA. Also refer to PRC-PRO-WKM-12115, Appendix K.

USQ Screening and Evaluations. Hazard Category 2 or 3 nuclear facilities that have a DOE-approved safety basis have specific requirements to ensure that work on SSCs important to safety do not compromise the requirements of the safety basis. PRC-PRO-NS-062, *Unreviewed Safety Question Process*, provides company direction on implementing DOE directive requirements in this area. Work activities must be "pre-screened" to determine if a formal screening is required. If the pre-screening determines that the work is covered by a Categorical Exclusion (CX), there is little impact on the planning process. If the work type is covered by a CX, the Work Planner should list the CX number in the work document. A simple entry of the CX document number in the Reference Document section or in a specific JCS field is sufficient. Minimum qualifications for applying a CX are listed in PRC-PRO-NS-062, Appendix D.

If a USQ CX does not exist for the type of work covered in the work document, then a USQ screening must be completed by a Qualified Screener for that facility. A copy of the USQ screening should be placed in the work package. USQ screenings may take several hours to complete. It is very important to arrange for the USQ screeners to be identified early to support the planning and work document approval process. In some cases, a USQ screening will indicate that a USQ evaluation must be performed. The evaluation process is even more rigorous, must be performed by a qualified USQ Evaluator, and takes even more time. As a general rule, modifications will require at least a USQ screening.

The DA and Nuclear Safety representatives are responsible to supply the appropriate technical information to the Work Planner in this arena. The Work Planner should list the USQ number in the Reference Documents section or a specific JCS field of the work document, and include a copy in the work package.

3.10 Work Package Assembly and Self-Checking

At the completion of the planning effort, it is a sound practice to do a self-check of the work instructions and work document to ensure all the necessary elements have been considered. An optional review checklist is provided in Appendix A, "Example Work Instruction Checklist." All topics on the checklist are discussed in the body of this guide. Use of the checklist is not mandatory, but is encouraged. Appendix B, "Work Package Folder Inclusion List and Arrangement," presents a checklist of materials that should be considered for inclusion in a work package.

The work document, including planned work instructions, and supporting documents are assembled into a work package within some kind of folder. The Document Record Folder (DRF) utilizes a two-hole faster at the top of the page and provides routing and work change notice (WCN) information on the front cover. There are two versions, the simple manila folder (store order 54-6000-202) and a pale green folder with multiple tabs for larger packages (store order 54-6000-801). The DRFs will fit into the boxes used for Records Holding. If the work package is large, you may use multiple DRFs if they are clearly marked (1 of 3, 2 of 3, 3 of 3, etc.) or you may use three-ring binders with appropriate cover sheets.

HRB Interface. If the HRB screening triggered a HRB meeting, contact the HRB Coordinator at the project and ensure that the meeting has been scheduled. After the meeting, be sure to place the meeting record in the work package. Specifics are found in PRC-PRO-WKM-40004, *Hazard Review Board*, and interfacing steps are found in PRC-PRO-WKM-12115.

Office of Civilian Radioactive Waste Management (OCRWM) Requirements. Some facilities have equipment that falls under the OCRWM Program. QAPP-OCRWM-001, *Quality Assurance Program Plan for Implementation of the OCRWM QARD for the Hanford Spent Nuclear Fuel Program*, requires that work documents on OCRWM designated equipment be identified as OCRWM related. Various methods can be used to flag the work document as OCRWM related; examples are: entries in the order title, entries in the "Reference Document" field, or OCRWM stamps on the work document folder. See QAPP-OCRWM-001 for specific guidance.

Controlled Use Information should be processed in accordance with PRC-PRO-IRM-184, *Information Protection and Clearance*. Work documents that would fall under Unclassified Controlled Nuclear Information (UCNI), Official Use Only (OUO), or Classified must be marked and controlled accordingly. JCS provides a means of printing appropriate headers on work document pages. The DRF must also be marked if any pages or within have been marked as controlled use.

3.11 Workability Review

It is recommended that work packages, particularly those that are more complex, receive a final workability review by the Field Work Supervisor and/or craft that will be performing the work prior to statusing as ready to work or scheduling for performance. A Work Package Workability Review Guide is provided as Appendix F.

4.0 FORMS

CHPRC ALARA Management Worksheet (AMW) (A-6004-634)
CHPRC Environmental Activity Screening Form (A-6004-962)
Fabrication Request form (Click on form name - go directly to the form)
Plant Forces Work Review (A-6004-530)
Pre-Demolition Checklist (A-6004-622)
CHPRC Training Completion Record - Work Planner Initial Qualification Card (A-6005-183)

5.0 RECORD IDENTIFICATION

All records generated per this procedure during the work management process are accumulated within work packages as prescribed by PRC-PRO-WKM-12115 and are stored and archived in accordance with RIDS developed per PRC-MP-IRM-40119, *Document Control and Records Management Plan, and* PRC-PRO-IRM-10588*, Records Management Processes.* A listing of the forms and other records are listed in the Records Capture Table of PRC-PRO-WKM-12115, Section 7.0.

6.0 SOURCES

6.1 Requirements

The requirements related to construction of planned work instructions are stated in PRC-PRO-WKM-12115. This guide facilitates work planning by providing guidance and details for implementing those requirements. PRC-PRO-WKM-12115 ensures that the requirements are met.

6.2 References

DOE-0336, *Hanford Site Lockout/Tagout*
DOE-STD-1029-92, *Writer's Guide for Technical Procedures*
CHPRC-00073, CHPRC *Radiological Control Manual*
MSC-PRO-140, *Utilizing General Supplies, Spare Parts, and Convenience Storage Inventories*
MSC-PRO-27075, *Hanford Site Public Water System Tie-In*
PRC-PRO-QA-283, *Control of Inspections*
MSC-PRO-479, *Pole Contact Permits*
MSC-RD-8589, *Hanford Fire Marshal Permits*
MSC-RD-9717, *Fire Prevention for Construction/Occupancy/Demolition Activities*
MSC-RD-9900, *Hot-Work Performance Requirements*
PRC-MP-IRM-40119 *Document Control and Records Management Plan*
PRC-PRO-AC-123, *Requesting Materials and Services*
PRC-PRO-AC-335, *Use and Control of Purchasing Card*
PRC-PRO-EN-129, *Controlling Spare Parts Inventory*
PRC-PRO-EN-2001, *Facility Modification Package Process*
PRC-PRO-EN-20050, *Engineering Configuration Management*
PRC-PRO-EN-286, *Testing of Equipment and Systems*
PRC-PRO-EP-15333, *Environmental Protection Processes*
PRC-PRO-IR-070, *Plant Forces Work Review (Davis-Bacon Act Compliance)*
PRC-PRO-IRM-10588, *Records Management Processes*
PRC-PRO-IRM-184, *Information Protection and Clearance*
PRC-PRO-MN-490, *Calibration Management Program*
PRC-PRO-MS-589, CH2M HILL Plateau Remediation Company Procedures
PRC-PRO-NS-062, *Unreviewed Safety Question Process*
PRC-PRO-RP-40108, *Radiological Hazard Screening*
PRC-PRO-RP-40109, Radiological *Hazard Controls for Medium and High Hazard Work*
PRC-PRO-SH-090, *Excavating, Trenching, and Shoring*
PRC-PRO-WKM-079, *Job Hazard Analysis*
PRC-PRO-WKM-12115, *PRC Work Management*
PRC-PRO-WKM-14047, *Pre-Job Briefings and Post-Job Review Guide*
PRC-PRO-WKM-40004, *Hazard Review Board*
PRC-RD-SH-11258, *Confined Spaces*
PRC-RD-SH-11827, *Hanford Electrical Safety Program Requirements*
PRC-RD-SH-15097, *Asbestos Control - Construction Industry*
QAPP-OCRWM-001, *Quality Assurance Program Plan for Implementation of the OCRWM QARD for the Hanford Spent Nuclear Fuel Program* DOE G 430.1-3, *Deactivation Implementation Guide*
10 CFR 1021 National Environmental Policy Act Implementing Procedures
FSP-PFP-5-8, *Technical Safety Requirement Compliance*

7.0 APPENDIXES

Appendix A - Example Work Instruction Checklist
Appendix B – Work Package Folder Inclusion List and Arrangement
Appendix C – Acronyms
Appendix D - Work Instruction Topical Information Guidance
Appendix E - intentionally deleted
Appendix F - Work Package Workability Review Guide
Appendix G - Troubleshooting Process Guidance
Appendix H - Enhanced Work Planning Guidance
Appendix I - Examples of Hold Points and Other Signature Fields
Appendix J - intentionally deleted
Appendix K - Work Instructions Template Example
Appendix L - intentionally deleted
Appendix M - Incorporating Hazard Controls into Work Instructions

Appendix A - Example Work Instruction Checklist

Also see Appendix K, Work Instructions Template Example

1. Scope

- Job site walkdowns complete?
- Work scope fully understood?
- End state defined?
- Work conditions used as a basis for planning identified?

2. References

- Drawings and references included?
- MSDS included?
- Sketches & Figures included?

3. Materials, Special Tools and Equipment

- eBOM included?
- M&TE called out?
- M&TE ID and Calibration Data logging included?
- Other Special Tools needed?

4. Precautions and Limitations

- Special safety requirements listed?
- Impacts on interfacing systems considered?
- MSDS identified for chemical hazards?
- Any limiting conditions, including for environmental conditions or for selected PPE?

5. Prerequisites

- Fabrication or shop work identified?
- Equipment/System lineups identified?
- Work area set up or conditions specified?
- Lock & Tag included?
- Required permits specified?

6. Work Steps

- Work Document Outline followed?
- Special safety requirements called out?
- Step Signoffs included?
- Hold Points included?
- Equipment rendered inoperable?
- Cleanliness Statements included?
- Weld requirements specified?
- Contingency planning included?
- Rigging requirements specified?
- ASME Repairs properly called out?
- TSR/LCO impacts called out?
- Plant labeling needs called out?
- Lessons Learned evaluated?
- Safeguards & Security Interfaces called out?
- Controlled property impacted?
- Electrical outages coordinated?
- Actions from HRB screening included?

7. Restoration & Testing

- Steps for Lock & Tag removal?
- Steps for system recovery included?
- Valves, breakers, switches?
- Retest with acceptance criteria included?
- PM/Operating procedures identified?
- TSR/LCO Surveillance procedures identified?
- Housekeeping and waste disposal addressed?
- Disposition of unused material addressed?
- Summary of “as left” conditions included for D&D work?

8. Startup Activities & Turnover

- Startup Test Plan with acceptance criteria included?
- Acceptance Inspection included?
- Turnover Checklist included?
- Spare parts and material turned over or dispositioned?
- CVI Data turned over?
- All pre-start items on Modification Impact Review Form completed?
- Functional retest included?
- Administrative retest (regulatory or TSR surveillance testing) included?
- Ops Review and Acceptance?

9. Permits, Forms, Plans and Other Documents that can Affect the Content of the Work Instructions

- Required permits included?
- AJHA included?
- Pre-Job Briefing form included?
- Post-Job Review form included?
- FMP included or Work Package CM Process Checklist done?
- HRB Meeting Minute form included?
- NCR resolution addressed?
- Modification Impact Review Form initiated?
- Environmental/NEPA screening complete?
- Is an NOI required?
- USQ screen/evaluation complete?
- Plant Forces Work Review (Davis-Bacon) complete?
- ALARA Management Worksheet (AMW) complete?
- Lessons Learned /CRRS reviewed?
- Critical Lift Plan required?
- Test Record required?
- Fall Protection Plan required?
- Waste Planning Checklist required?
- Other?

Appendix B – Work Package Folder Inclusion List and Arrangement

Include items from list below in work package only as required or necessary. Although not required, projects or facilities may establish policy expectations on order or location of documents within a work package if desired for consistency purposes.

- Table of Contents (Construction work packages only)
- Work Release
- Work Instructions
- FMP or Other Design Documents
- Special Plans or Instructions (e.g., Fall Protection Plan; Critical Lift Plan; Startup Test Plan, etc.)
- Technical Procedures called out for performance by work instructions (if controlled copies not readily accessible)
- Data Sheets; Test or Inspection Records; Lifted/Landed Lead Log, or other required forms
- Work Record
- Signature Verification Log
- Pre-Job Briefing Form
- Post-Job Review Form
- AJHA
- Required Permits
    - Radiological Work
    - Hot Work and other Fire Marshall Permits
    - Energized Electrical Work
    - Confined Space Entry
    - Asbestos Work
    - Excavation
- Modification Impact Review Form
- NEPA and Environmental Screening (per PRC-PRO-WKM-12115)
- Material Safety Data Sheets (per PRC-PRO-WKM-12115)
- Waste Planning Checklist
- ALARA Management Worksheet
- Reference Drawings, Vendor Information, NCRs, or other support material (if needed for field reference)

Construction Work Package Order of Contents

Construction work packages (CWP) are assembled in the following format. Each section in the work package is labeled with identification tabs to allow it to be readily located. For consistency, the order described below should be used to assemble applicable documents within CWPs unless there are overriding factors.

- Table of Contents (optional)
- Work Document (JCS printout, if used)
- Modification Impact Review (if work involves a facility modification)
- Release Documents (maintained by the Construction Supervisor/Superintendent)
- Work Instructions
- Attached documents (as referenced by Work Instructions)
- Permits (e.g., Excavation Permit, Hot Work Permit, Confined Space Permit, RWP, etc.)
- AJHA (Automated Job Hazard Analysis) or other hazard analysis documentation accepted by CHPRC
- Waste Planning Checklist
- MSDS(s)
- Work Record
- Miscellaneous

Organizing Large Work Packages

Large work packages sometimes present a practical difficulty of arranging the information in a logical manner while still making that information easily accessible to the field work team. The exact order of the documents within a work package is not prescribed, however it should always be easy to find the release and suspension signatures and the work instructions. If more than one document holder (e.g., DRF or binder) is needed, each one should be clearly marked (e.g., 1 of 3, 2 of 3, etc.), and the labeling scheme adjusted to fit the specific circumstances.

If three-ring binders are used, it is helpful to use labeled page dividers to help the field work team locate the various documents within the work package. Three-ring binders will not fit into the boxes used by Records Holding. A multi-tabbed Document Record Folder (“green DRF”) is available for work packages up to a certain size. This is form 54-6000-801, available from Stores. The following labeling scheme has been effective.

Table B1 – Organizing Large Work Packages

Page description	Historical terms for forms, and green DRF labels	Suggested Labels (historical term in parentheses for cross-reference only)
Inside front cover	J6 J8 J9	• Work suspension (J8) • Partial release sheets (J9) • Mod Impact Review (J6) • Component Index Form • WAM
1st tab front	J1 J2	• Work Document (J1) • Work Instructions (J4, J4a) • Work Change Notices
1st tab back	J4 J4a J7	• Rad Hazard Screening • RWP • AMW • Waste Planning Checklist
2nd tab front	J5/Craft Resource Log	• Work Record (J5) • Signature Log
2nd tab back	Permits/ Pre-job	• Pre-Job Briefing Form • AJHA • Post-Job Review form • Permits • MSDS
3rd tab front	ECN/ Procedures	• FMP • NEPA exclusion form • CERCLA, documentation • Procedures • USQ
3rd tab back	BOM	• eBOM
Inside back cover	Supplemental Documents	• Supplemental Documents • Weld maps and records

Appendix C – Acronyms

For acronyms in common use at Hanford, see the listing on the DOE external website: http://www.hanford.gov/communication/acronym/

Appendix D - Work Instruction Topical Information Guidance

Table D-1 - Linked List of Planning Topics –Click on link - go directly to the topic.

Asbestos Containing Material. Include in work documents that encounter asbestos containing material the requirements found in PRC-RD-SH-15097, *Asbestos Control - Construction Industry*, and PRC-PRO-EP-15333, *Environmental Protection Processes*. Facilities containing asbestos containing material are posted per PRC-RD-SH-15245. Additionally, many facilities have used a practice of painting potentially asbestos bearing insulation with pink paint. In these cases, the color may be used as an indicator that asbestos controls are required for work on this insulation.

When planning and executing an asbestos related work document, an "asbestos competent person," as identified in 29 CFR 1926.32, who has been trained as an "asbestos supervisor," will need to be involved in the planning and work execution process. The work planner does not need to be trained as an "asbestos project designer."

ASME Coded Work. Work documents that involve work on American Society of Mechanical Engineers (ASME) code boundary parts or replacement of ASME coded items include an ASME Work Instruction. Example: Engineering Instruction (EI)-087 at Fast Flux Test Facility (FFTF).

See PRC-RD-EN-19440, *Design, Inspection, Testing and Repair of ASME-Coded Pressure Systems and Safety Relief Valves*, for further information.

Beryllium Containing Systems. For work that involves beryllium containing systems, include the provisions found in PRC-PRO-SH-6155, *Chronic Beryllium Disease Prevention Program (CBDPP)*, in the work instructions. Special requirements dealing with work planning, personnel assignments and monitoring must be met. If work is planned that involves dust-disturbing activities directly on these materials (such as grinding, sanding, welding, etc), the potential for airborne beryllium exposure should be reevaluated prior to performing the work.

See PRC-PRO-SH-6155 for criteria that require a documented hazard assessment per PRC-PRO-WKM-079. Work that will take place in buildings that have been identified as "suspect for beryllium" must have a Beryllium exposure assessment completed, which may stand alone, or can be activated via the AJHA. Each contractor is responsible for the assessments of the buildings under its authority. The beryllium-suspect buildings under the authority of CH2M Hill are found at this link: http://www.hanford.gov/safety/beryllium/curfclst.htm. See also PRC-PRO-WKM-12115, Appendix J.

Blind Penetration Work. For blind penetration work, potential hazards should be assessed and controls selected using the following logic process:

- Review drawings, including outstanding ECNs/FMPs to help identify possible utility obstructions inside walls, floors, and ceilings. The drawings should rarely be relied upon alone to establish the existence or location of obstructions, so some additional confirmation of the potential for obstructions is prudent.
- Conduct a job site walkdown to visually inspect above, below, and on all sides of the area to be penetrated. Be aware that utility lines don't always follow the path indicated by any visible portion of the line.
- Consider alternatives to drilling (e.g., surface mounting, self-tapping wall anchors, etc.)
- Remove sheet rock, steel siding, or other cover material if possible and if the potential hazard is significant. Pilot holes to allow visible inspection may be useful.

- Use Ground Penetrating Radar (GPR), Radio Frequency Electromagnetics, (RF), 50/60 Hz Electromagnetic Field Detectors, and Magnetic detectors or stud finders to help locate concealed lines and rebar. The limitations for each of these methods should be considered when consulting with the scanning personnel.
- Use an electronic drill-stop device to stop the tool, drill or saw motor when the tool bit (or saw blade) contacts grounded metal.
- Use a mechanical drill-stop to prevent over-penetration. Drill bit length, saw blade depth, etc., should be no greater than needed.
- De-energize and lock out electrical circuits in the vicinity if their exact location cannot be determined.
- Use Electrical Personal Protective Equipment (PPE) if the employee will be exposed to potential electrical hazards. Consider use of arc flash protection (fire retardant clothing).
- Use a backup safety watch, qualified in electrical rescue techniques and Cardiopulmonary Resuscitation (CPR), if there is a potential shock hazard from contact with energized conductors.
- If any rebar has the potential to be cut, structural engineering support should be consulted for input and should approve the work instructions.

Breaker, Switch, and Valve Positioning. If the work activity requires positioning of valves, switches, and breakers to isolate a component for the work activity, consider including valve/switch repositioning steps, a system line-up or restoration per established operating procedures, and/or a functional test to be performed to verify proper system operation prior to returning the equipment to an operable condition. See also Lock and Tag Instructions.

Chemical Use. Work documents that involve the use of, or exposure to, hazardous chemicals are reviewed for acceptability of the hazardous chemicals identified by Industrial Hygiene staff. If the chemical is not routinely used at the facility, include an MSDS in the work package and reference its use and required controls in the AJHA. Consider hazards of chemical storage, such as secondary containers, temperature considerations, the effects of fumes or volatiles, development of shock-sensitive crystals over time, etc. The work instructions should provide information on any special precautions or protection required to safely handle and dispose of the hazardous chemicals involved.

Cleanliness Standards. Work documents that require special cleanliness and/or cleanliness control conditions should include references to the special conditions needed. See also Foreign Material Exclusion.

Confined Spaces. See PRC-RD-SH-11258, *Confined Spaces*, for guidance on making confined space entry work requiring permits. Some work instructions may be needed to support the requirements of the RD and the work activity being planned.

Construction Work Packages (CWP). CHPRC work planners may be asked to assist in assembling work instructions and/or work packages for construction. "Self-performed construction" for CHPRC is performed by EPC. EPC Construction work is governed by the set of procedures called PRACTICES and must comply with CHPRC procedures, including PRC-PRO-WKM-12115. Outside construction work (subcontractor) is governed by a legally binding Statement of Work (SOW). The work management interfaces described in the SOW must be adhered to. All work release for CHPRC, regardless of who performs the work, is conducted per PRC-PRO-WKM-12115. Consult the procedure TA or a facility work management representative for clear guidance on how to proceed.

Controlled Property. If equipment is to be removed from the plant and it is identified in the Site property system database (contact your assigned property representative if unsure), disposition the equipment in accordance with PRC-RD-PMT-11408, *Property Management Requirements*. The MIR can be used to capture needed information in the field

Documents Used to Generate Instructions. Do not include documents used to develop work instructions unless they are germane to the work covered by the instructions. Documents referenced by the work instruction that will be used to perform work are required to be in the work package unless controlled copies are readily available.

Electrical Jumper and Wire Installation/Removal for Testing/Troubleshooting. Electrical wires (jumpers) may be temporarily installed or existing wiring temporarily removed to perform a test or troubleshoot an operational problem (not for purposes of short- or long-term system modification) with the intent that they be removed at the completion of testing/troubleshooting and the system returned to its original configuration. In these situations, a *CHPRC Electric Jumper Installation/Removal Record* (A-6004-958) and/or a *CHPRC Lifted/Landed Lead Record* (A-6004-960), with instructions for their use, should be included in the Work Package as appropriate. Comply with the requirements for energized electrical work of PRC-RD-SH-11827 (shock and arc flash analysis, PPE, and justification for energized work if the troubleshooting could be accomplished with the equipment de-energized.) The existing Site Forms were generated at certain facilities; other facility-specific procedures and forms may be utilized for electrical jumpers and lifted leads if they address the constraints utilized on the existing Site Forms. Whenever breaking or reestablishing the continuity of a neutral circuit conductor, and it cannot be predicted with absolute certainty that the action would not expose a worker to live parts, the tasks shall be considered energized work and the safe work practices for working on or near live parts shall be used. Format the work instructions to accommodate this challenge. See Energized Work.

Electrical Modifications. When applicable to a work package, NEC inspections should be included in the work instructions prior to energizing/reenergizing the system. See also Panelboard Modifications.

Electrical Outages. Work instructions that involve electrical outages will typically contain specific steps for de-energizing and restoring plant equipment. Outage instructions may be included in the individual packages, or in an umbrella work document for coordinating multiple electrical outage packages. Electrical switchgear preventive maintenance containing outage instructions should be carefully reviewed for adequacy and existing plant conditions. Load lists for electrical distribution panels should be reviewed to determine equipment affected. If the outage is extensive, consult Operations/Facility Owner(s) for assistance in preparing the outage instructions in a way that does not compromise the facility requirements. If the electrical outage will require isolations to be conducted in the site distribution system, involve the Electrical Utilities group. Cognizant electrical engineers have access to interface agreements and know when breakers and disconnects must be operated by the FH Electrical Utilities group. See also MSC-PRO-478, *Electric Service Request*, when needing EU services.

Emergency Responses. If the work involves unusual hazards and controls, or will take place in an unusual location or adjacent to hazardous work, discuss during the planning whether to include information about emergency responses in the work instructions. The emergency response could be related to a plant system or facility, to injury to a worker as a result of the job, or even response to a site emergency signal. For facility responses, consult project experts for the appropriate level of information to include in the work instructions. For site emergency response, see the local EP coordinator, or refer to PRC-RD-EM-7647, *Emergency Preparedness Program*.

Energized Work. If equipment cannot be de-energized without introducing additional risk, or de-energization is impractical, include in the work package (unless specifically covered by other approved documentation) a justification for working on or near energized electrical parts. This applies when energized parts are at $\geq$ 50 volts (AC or DC) nominal, with a current capacity of $\geq$ 1 milliamp. Additionally, identify in the work document the nominal voltage to be worked on or near. Shock hazard and/or arc flash hazard controls may need to be included in the work instructions. Consult PRC-RD-SH-11827, *Hanford Electrical Safety Program Requirements*, for current requirements. A *CHPRC Energized Electrical Work Permit* (A-6004-799) could be required. It may also be necessary to apply the requirements for energized work when equipment is deranged or a de-energized status cannot be verified prior to beginning work.

For electrical energized work that is exempted from an EEWP, several pieces of information must be documented within the work instructions. In all cases, comply with PRC-RD-SH-11827 and NFPA 70E (2009). Required information should be supplied by the DA and or FWP, but include items such as

- Description of the work to be performed identifying circuit(s) and equipment [10 CFR 830.122(d)(1)]
- Justification for Energized Work [Article 130.1]
- Description of safe work practices to be employed [Article 110.8(B)]
- Results of the shock hazard analysis [Article 110.8(B)(1)(a)]
- Determination of shock protection boundaries [Article 130.2(B) and Table 130.2(C)]
- Results of the arc flash hazard analysis [Article 130.3]
- The necessary personnel protective equipment to safely perform the assigned task [Articles 130.3(B), 130.7(C)(9), and Table 130.7(C)(9)]

- Means employed to restrict the access of unqualified persons from the work area [Article 110.8(A)(2)]
- Evidence of completion of a job briefing, including a discussion of any job-specific hazards and hazard controls to be used. [Articles 130.2, and 110.7(G)]
- Evidence of adequate work package review and approval by appropriate personnel. 10 CFR 830.122(d)(1)]

Whenever breaking or reestablishing the continuity of a neutral circuit conductor, and it cannot be predicted with absolute certainty that the action would not expose a worker to live parts, the tasks shall be considered energized work and the safe work practices for working on or near live parts shall be used. Format the work instructions accordingly.

See also PRC-RD-SH-28954, *Equipment Operation near Overhead Electrical Line,* for additional requirements if the work will take place in the vicinity of overhead lines. See also Overhead Electrical Lines, and Lockout/Tagout.

Environmental Activities. Environmental processes from PRC-PRO-EP-15333, *Environmental Protection Processes*, are integrated into the AJHA to implement environmental related activities. Effectively, all work at Hanford requires some NEPA determination to be documented. This can nearly always be accomplished by application of a CX, by use of a formal AJHA, or via an EASF. The AJHA hazards questions may trigger required environmental regulations and appropriate environmental review and/or documentation (e.g., NEPA/CERCLA review, Cultural and/or Ecological Resources Reviews, permit applications/modifications) per PRC-PRO-EP-15333. Answers to certain hazardous questions with potential environmental effects will trigger the Environmental Compliance Officer (ECO) for involvement. Before starting any demolition or renovation activities, contact the Cognizant ECO to determine if the activities require submittal of a Notification of Intent (NOI) to the Benton Clean Air Authority (BCAA). See also PRC-PRO-WKM-12115, Appendix F. See also *Pre-Demolition Checklist* (A-6004-622).

Excavation Activities. Per PRC-PRO-SH-090, *Excavation, Trenching and Shoring*, a single Responsible Person must be designated to ensure the necessary planning, controls, ground scans, and other aspects of the Excavation Permit process are followed. In most cases, the work planner will be the designated Responsible Person for these activities.

Exit Signs. Some commercially supplied exit signs are illuminated by tritium. Individual signs could contain up to 25 Curies of tritium and care must be taken in handling these signs to prevent breakage. They must be processed as low level waste or returned to the vendor when they are removed. Also, they may be encountered outside of posted and controlled radiological areas. Include appropriate precautions in D&D and maintenance packages that will include handling of these signs. If unexpected breakage occurs, be sure to contact Radiological Protection for assistance.

Fall Protection. Consult PRC-RD-SH-8801, *Fall Protection*, for planning requirements related to work on elevated work platforms, roofs, etc.

Fire Prevention & Control. Fire prevention and control must be evaluated for work performed at Hanford. This evaluation will be part of the Job Hazard Analysis (JHA), and the AJHA or similar tool may be used to perform the analysis. Non-emergency tie-ins to fire hydrants *(Nonemergency Hydrant Tie-In Permit* [A-6003-681]) must be prepared by the requester with assistance from and approval by the applicable water purveyor. The completed form should be forwarded to the Hanford Fire Marshall for final approval. Complete guidance on fire prevention and controls may be obtained from MSC-RD-9717, *Fire Prevention for Construction/ Occupancy/ Demolition Activities.* See MSC-RD-8589, *Hanford Fire Marshal Permits*, for guidance on activities requiring a Hanford Fire Marshal Permit. Guidance on preparing a Fire Hazards Analysis may be obtained from HNF-RD-9390, *Fire Hazard Analysis Requirements*. The CHPRC endorsed most HFD procedures for use at PRC projects.

Fire Watch/Hot Work Requirements. Special planning requirements must be considered for hot work activities such as welding, brazing, grinding, torch cutting, etc. Depending on hazard level for the work, certain controls must be identified, such as, fire watches, PPE, confined space requirements and Hot Work Permits obtained. For complete guidance on preparing for Hot Work activities, refer to MSC-RD-9900, *Hot Work Performance Requirements.*

Foreign Material Exclusion. Activities related to the design, procurement, construction, operations and maintenance of Safety Class (SC) and Safety Significant (SS), and General Service (GS) structures, systems, components (SSC) requiring additional controls beyond standard commercial practices, as directed by Design Authorities (DA) require cleanliness controls as prescribed in PRC-PRO-QA-33415, *Structures, Systems, Components Cleaning/Cleanliness and Foreign Material Exclusion*. Consult this procedure concerning the responsibilities and processes necessary to ensure the cleaning and cleanliness of SSCs and the control measures necessary to minimize the introduction of foreign material into SSC interior surfaces and spaces. See also Cleanliness Standards

Heat Stress Control. Work that involves potential for heat stress must be evaluated prior to performing work. This evaluation will be part of the JHA, and the AJHA or similar tool may be used to perform the analysis. Consult PRC-PRO-SH-121, *Heat Stress Control*, for complete guidance on evaluating the risk of heat stress and the controls used to prevent it.

Heavy Equipment Operation. Heavy equipment may be required for the work being planned. Heavy equipment includes mobile cranes, track hoes, forklifts, excavators, dump trucks, flat bed trailers with large loads, and other commonly used construction equipment. This equipment tends to be large and can come into contact with overhead structures if the planning is not adequate. There are several CHPRC documents that identify requirements for the use of this equipment. See Overhead Electrical Lines.

PRC-RD-SH-9237, *Motor Vehicle/Bicycle Safety*, contains the requirements for moving Oversized/Overweight loads and invokes the requirement to use a permit. The permit identifies what constitutes an oversized/overweight load and details what special precautions must be taken to move these loads. DOE RL DOE-RL-92-36, *Hoisting & Rigging Manual*, Chapter 14 contains requirements for mobile crane transportation and use around energized power lines. Clearance requirements in Chapter 14 come from OSHA standards.

The Electrical Utilities organization should be contacted any time there is a question about work clearances from any overhead line. They will provide guidance for the planned work and assist in de-energizing lines and/or moving lines as appropriate. See also Overhead Electrical Lines.

Projects or facilities might also have requirements for heavy equipment that should be considered when planning work where this sort of equipment will be utilized. For instance, at PFP the use of any equipment or load that weighs more than 25,000 pounds and that will be moved or parked off of established roadways inside the PFP Protected Area must first be approved by the Structural Engineer for the facility. See FSP-PFP-5-8, Chapter 13.9. Other facilities may have similar requirements that should be considered, even if the heavy equipment is merely to be parked off the roadways when not in use. The issue in that case is inadvertent damage to underground utility systems.

Another hazard whenever heavy equipment is being used off of paved surfaces is the potential instability of the surface. This could cause the equipment to become mired, or worse, tip over. See Lessons Learned http://www5.rl.gov/opex/lesson.asp?id=1421

Depending on the circumstances, it might be appropriate to define a specific path for such equipment. The path would provide safe transit, considering overhead lines, underground equipment, surface instability, potential contact with other equipment (e.g., the arc of a counterbalance) and general staging of supplies and equipment.

High-Hazard Activities and Management Review. Known High-Hazard Activities that could result in significant consequences (e.g., radiological, explosive, etc.) require documentation to be placed in the work instructions to clearly state the required immediate actions should such an event occur. If notifications are required prior to work starting, the work instructions should include a statement to make the notification with a signature block for the FWS to sign indicating the notification has been made. These activities may require a Plant Review Committee review in hazard category 2 or 3 nuclear facilities or Hazard Review Board for radiological activities with higher radiological hazard (refer to CHPRC-00073, *CHPRC Radiological Control Manual*). The PRC in most cases will roll these management reviews into the Hazard Review Board process per PRC-PRO-WKM-40004.

Hold Points. Hold points should be used in work instructions when there is a specific need to insure the work activity is in a condition that meets the hold point criteria before proceeding. The hold points typically fall into the Radiological Control, Quality Assurance, Acceptance Inspection, and Technical Support functional areas. Hold points are used when the safety impacts of missing a hold point are significant. The completion and documentation of hold points must occur prior to proceeding to the next working step in the technical work document. See PRC-PRO-QA-5432, *Hold Point Application in Technical Work Documents*, CHPRC-00073, Article 315, and PRC-PRO-QA-283, *Control of Inspections,* for company guidance on how and when to apply hold points. Hold points are a form of record authentication, and therefore must comply with formatting instructions in PRC-PRO-QA-5432.

Hoisting & Rigging (Lifting by Mechanical Means). Work instructions that involve lifting, handling, or moving of equipment by mechanical means should address handling and rigging requirements per DOE-RL-92-36, *Hanford Hoisting and Rigging Manual*, as applicable. Hoisting and rigging evolutions that have been deemed as Critical Lifts require specific instructions and approvals.

Human Performance Improvement (HPI). HPI is a philosophy of doing business in a manner that reduces errors. There are many facets of business where HPI can have an effect on productivity, safety, efficiency, worker morale and more. In the arena of work planning, HPI can be an effective tool because it assumes that everything will not go perfectly, determines what errors are likely to occur, and plans to reduce the consequences of those errors. The errors could be equipment malfunction or human mistakes, but for every error we can think of ahead of time, we can also devise a means to prevent it altogether or at least reduce the consequences if it occurs. During work planning, especially when the team is walking down the job or conducting scoping or hazard analysis meetings, it is often useful to ask the four key questions and then incorporate the answers into the work instructions as appropriate. The term "Four Key Questions" refers to these, sometimes called the SAFER dialogue:

1. **S**ummarize the critical steps. What are the critical steps or phases of this task? (Important parts of the task that must go right)
2. **A**nticipate error traps. How can we make a mistake at that point? (Review error precursors)
3. **F**oresee consequences. What is the worst thing that can go wrong? (Review potential consequences and contingencies, what can go wrong during this activity?)
4. **E**valuate defenses. What barriers or defenses are needed? (Peer check, 3-way communication, place keeping, flagging, etc. How can we prevent that from happening? If we cannot prevent that from happening, what can we do when it happens to make it less of a problem?)
5. **R**eview past events. Dispel the attitude that nothing can go wrong with a discussion of what has gone wrong in similar work in the past.

Lock & Tag Instructions. It is not mandatory that specific lock and tag boundaries be included in the work instructions, but if a lockout/tagout boundary is necessary to perform the work, this fact should be noted in the precautions and limitations section.

Hazard analysis is part of the Work Management Process described in PRC-PRO-WKM-12115 and this guide. The implementation of the safe work boundary is accomplished per the Hanford Site Lockout/Tagout process described in DOE-0336, *Hanford Site Lockout/Tagout*, which defines criteria by which the lockout/tagout boundary is to be identified. It also states that if the normal means (e.g., drawings, databases, documents and/or a field walkdown) are not adequate to identify the safe work boundary, then alternate steps in the work document are to be utilized. In these cases, the author of the work instructions must work closely with the TA, Controlling organization and the work team to provide adequate instructions that will determine a safe working boundary and positively verify that boundary through an appropriate safe condition check.

It is desired that the planning team suggest a draft tagout plan during the hazard analysis process. This plan should state the hazards for which a tagout boundary is needed (mechanical energy, electrical energy, chemicals, etc.) and can go as far as to recommend isolation points. The controlling organization will consider this information when developing the lockout/tagout for the work, but they have the responsibility per DOE-0336 to determine and provide for verification of the LOTO boundary. Boundary requirements and Safe Condition Check location and method should be incorporated into the Tagout Authorization Form by the controlling organization. If the LOTO process must be sequenced to accommodate the work scope, this information should be incorporated into the work instructions at the appropriate steps.

Locking devices do not exist on all installed equipment. DOE-0336 provides a number of examples on how to deal with this issue. The draft tagout plan should include any known deficiencies in this area and provide suggestions for successfully isolating the boundary. Field work could be required in some cases, and the planner should consult with the Controlling organization and the workers to determine the best method to accomplish this work.

If lockout/tagout (safe work boundary) is required for the work, include a statement in the Precautions and Limitations that LOTO is required for this work. The specific safe work boundary points do not have to be included in the work instructions.

If, because of the complexity or uncertainty of the safe work boundary, the choice is made to include tagout boundaries and required equipment positions in the work instructions, then it is usually prudent to also include the safe condition checks that will be utilized to verify this complex boundary. This can never replace the documentation requirements on the TAF of DOE-0336, but in some cases provides a clearer sequence of the process than can be done using the TAF alone. If this method is used:

- The WI should be developed with the assistance and cooperation of the controlling organization (CO), which has responsibility over the equipment or system where the work will occur.
- The WI should include a signoff spot for the CO to indicate the tagout is in place (at each applicable step, if appropriate to the work sequence),
- The WI should include a signoff for the FWS or craft to signify that the necessary work is complete before the tagout is cleared if the WI include a sequence where tags are to be removed in a specific sequence beyond what can be clearly captured on the TAF, or if there are iterations planned where tags are hung and/or cleared during the course of the work. These signoffs do not authorize removal of the tags, but indicate that the work is done up to the point that appropriate tags could be removed. Authorization to remove or implement LOTO is always provided by the CO as documented on the TAF in accordance with DOE-0336, *Hanford Site Lockout/Tagout*. The CO should determine what is appropriate in these cases.

If the safe work boundary (LOTO) is to be implemented incrementally or altered during performance of the work, consult with the Release Authority (RA) to determine the most appropriate means to ensure that the RA is involved with integration of the work and the safe boundary changes. Verify the work instructions provide adequate structure to ensure that the isolation boundaries are clearly defined in each configuration change, or the RA controls authorization utilizing partial work release.

Per DOE-0336, the Safe Condition Check should be performed at the work location if possible. For additional guidance, refer to DOE-0336.

Modification Impacts. A modification has the potential to require changes to facility technical drawings, safety bases, CVI file information, procedures, training programs, environmental permits, etc. for the system being modified. The *Modification Impact Review* (MIR) form (A-6004-963) is used to systematically identify required changes and insure they are in place at the completion of the work, prior to system turnover for use if so specified. A MIR is required for all CH2M HILL modifications whether or not an FMP was required to document the change. The Design Authority (DA) or Construction Engineer (CE) has the lead responsibility for developing this form, which should be initiated at the start of planning the work package. The MIR form is included in the Forms section of this guide. The MIR form in the JCS program may also be used if it has been updated to be equivalent to the Site Form.

The form allows for actions to be completed either before the retest of the work, or before work package final closure, depending on the effect of the change. In some cases, it may be helpful to the field work team if some reminders related to the MIR are included in the work steps to allow the process to integrate as efficiently as possible with the field work. The planner should consult with the FWS on this issue.

Filling out the MIR is the responsibility of the DA/TA, but the Planner often facilitates these activities. Also note that the work management process will assist completing actions on the MIR, but Engineering is responsible for the FMP. For instance, a list of procedures on the FMP will not be tracked by the work management process; only those procedures transferred to the MIR will be tracked by the work management process. Projects may have differing mechanisms for this tracking.

If a modification will be performed sequentially on redundant equipment, or is only planned for some of the equipment, consult with the Procedures group and Operations to determine the best strategy for changing the procedures so that they apply correctly to both affected and unaffected equipment. The procedures may have to transition several times during the course of the planned plant changes.

Refer to PRC-PRO-EN-20050, *Engineering Configuration Management*, for an overview of available Configuration Management Processes. When determined that a Facility Modification Package (FMP) is not required in accordance with PRC-PRO-EN-20050, projects are allowed the flexibility to use a graded approach consistent with their unique operational and organizational requirements and may establish a project specific configuration management process consistent with American National Standards Institute (ANSI) Electronics Association EIA-649-1998, *National Consensus Standard for Configuration Management*. The DA prepares *Work Package Engineering (WPE) Coversheet* (A-6005-105) per PRC-PRO-EN-20050 to determine if the process may be used.

If a FMP is required, refer to PRC-PRO-EN-2001, *Facility Modification Package Process*. Work with the DA/TA to ensure that pertinent information from the FMP is transferred to the work instructions. One example is a retest that was specified in the FMP cannot be assured to take place unless it appears in the work instructions. See also Nuclear Safety Systems Work for information related to USQ matters for modifications.

If a FMP is required, the ECO or signature equivalent should be contacted to perform the required NEPA or CERCLA review per PRC-PRO-EP-15333, *Environmental Protection Processes. If the AJHA tool is used for hazard analysis, the environmental reviews will be captured without having to use a separate EASF.*

Before starting any demolition or renovation activities, contact the Cognizant ECO to determine if the activities require submittal of a Notification of Intent (NOI) to the Benton Clean Air Authority (BCAA). See also *Pre-Demolition Checklist* (A-6004-622).

For most modification work a design verification signature is required from the DA to validate that the work done faithfully implemented the design change that was approved. This signature must be obtained before the work package may be closed out. If a FMP was used, a design verification signature is required on the FMP itself. PRC-PRO-EN-20050 requires a similar signature for non-FMP modifications. If there is no FMP, it is best to supply a signature block in the work instructions for this purpose; consult with the DA for the specifics.

Nuclear Safety Systems Work. Hazard category 2 or 3 nuclear facilities using approved safety bases often have special operability requirements for key safety systems. The specific Limited Conditions for Operation/Technical Safety Requirement (LCO/TSR) requirements may have alternate monitoring requirements or time clocks associated with taking the system from an operable state to an inoperable state, or other limits related to which equipment can be inoperable under various circumstances. These constraints must be considered in the planning effort.

Work instructions that affect Technical Specification/Safety Basis related equipment need to clearly identify the applicable Technical Specification/Safety Basis, state any interim or mitigating measures required, and specify the recovery and retest required to restore the equipment and/or system to within the bounds of the Safety Basis/Technical Specification limits and to operability.

It should be stated in the work instructions if work is on a Safety Class/Safety Significant SSCs. Consideration may be given to stamping or otherwise flagging work packages that perform work on Safety Class/Safety Significant equipment or systems – if this approach is adopted, it should be applied consistently within a project or facility.

It is extremely important in the work instruction to identify the point at which the safety system is no longer operable for regulatory purposes and to gain special approval from Operations before making it inoperable. A CAUTION statement should be inserted just prior to the step that makes the system inoperable, alerting the operating organization that system inoperability is about to occur. This should be followed by an acknowledgment step for the operating organization to sign, indicating it is acceptable to proceed.

The full scope of work taking place under the modification work package must be addressed by the Unresolved Safety Question (USQ) process per PRC-PRO-NS-062. The FMP and the work instructions may be addressed by a single USQ screening or evaluation if the USQ document clearly states that it was intended to do so. This may not be practical if the FMP must be approved and released far in advance of the work instructions. In that case, two USQ screenings or evaluations may be required. Consult a qualified USQ evaluator for specifics.

Nuclear Safety personnel will determine when a USQ for Transportation and Packaging (TP) is required. The USQ_T process is to determine approval requirements for a proposed change, test, or experiment associated with transportation activities. Only TP may provide the USQ_T screenings/determinations to the planner as required by PRC-PRO-NS-062, *Unreviewed Safety Question Process.* The USQ_T process must be completed before implementing a proposed TP activity (design modification, activity change, procedure change). For modifications, the USQ_T determination is completed before the modified document is released to perform work in modifying packaging systems.

Overhead Electrical Lines. If work will take place in the vicinity of overhead electrical lines, consult PRC-RD-SH-28954, *Equipment Operation near Overhead Electrical Lines*, for additional elements that may be required in the work instructions. Overhead electrical lines pose a special risk. Per PRC-RD-SH-11827, *Hanford Electrical Safety Program Requirements*, EU should be notified at least 48 hours before work that may affect or that is within the limited approach boundary of EU conductors and equipment, or if movement of vehicular or mechanical equipment over 14 feet high is planned. All overhead lines should be treated as energized and the basic clearance requirements in the referenced documents followed.

OUO and UCNI work instructions. If the work instructions are being developed that will be considered as information that needs to be protected or cleared in accordance with PRC-PRO-IRM-184, the Planner must understand his or her responsibilities in this area before beginning. Depending on the work, there are restrictions on how the information may be stored, how it must be marked, and so on. See PRC-PRO-IRM-184 for how to identify, mark, store and handle such information. Notice that the person who generates the information is responsible to identify and mark the files, hard copies, etc. Some JCS programs provide the ability to print headers or footers with these designations.

Painting. Painting and similar activities can present certain hazards to the workers, depending on the surfaces and the paint being used. For some abrasive blasting and some airless spray painting activities consult PRC-PRO-SH-31697, *Controlling Exposures to Hexavalent Chromium*, for details related to chromium. Be sure to consult the Industrial Hygienist for clarification on the correct controls during the use of any new or unfamiliar paint or solvents.

Panelboard Modifications. If electrical panel configuration (supported loads) is changed, panelboard identified load information must be updated. Refer to PRC-PRO-WKM-12115, Appendix G, for additional information regarding panelboard modifications.

Photographs. Photographs are recommended to aid in work planning, particularly when it is not practical or good ALARA practice to have everyone who will be involved in the planning visit the actual work site. Photographs will improve understanding and communication in general. Hard copies of photos may be placed in the work package if needed and JCS systems may also have the capability to embed digital or digitized photographs directly into work instructions.

Portable Ladders. Access to the work site may require the use of portable ladders if another means of accessing the work is not feasible, such as scaffolding or an aerial lift. A portable ladder is one which is self-supporting or non self-supporting, and can be readily moved or carried, usually consisting of side rails joined at intervals by step, rungs, cleats, or rear braces. The decision to use a portable ladder and the choice of ladder must be authorized by supervision and documented. Working from a ladder when the worker's feet are >6 feet off the ground must include a fall protection plan. A second worker must be identified to hold the ladder. The requirements for selection, inspection and the use of portable ladders are provided in PRC-RD-SH-24243, *Portable Ladders*.

Procedures in Work Instructions. Pre-approved procedures may be used to assist the planning process with some constraints. Approved procedures incorporating all necessary work elements may be performed on demand as standalone work documents; however, if they are incorporated into a Work Package with unapproved procedures, the Work Package in its entirety must be approved before performing any of the work elements. This also applies when sections or steps are lifted out of a procedure and pulled into work instructions; the text must be reviewed and approved as part of the work instructions. Something else to consider when using procedure steps in work instructions is whether any of the prerequisites, retest or recovery actions from the donor procedure also need to be incorporated into the work instructions along with the performance steps. See also Vectoring.

Sometimes procedures are referred to by work instructions. The Planner should be careful to accurately call out step numbers and figures, and to understand the work well enough so that the work instructions do not ask the workers to violate the procedure in some way. Also note that there are constraints on the use of some FFS procedures available to CH2M HILL. For instance, instructions related to anchor bolts and other structural concerns are provided as guidance only per PRC-PRO-EN-097, *Engineering Design and Evaluation*, and as such must be brought into the package and approved for use in the desired application during work instruction review and approval.

Quality Control Inspection. Characteristics to be inspected, methods of inspection and acceptance criteria are identified during the work package planning process for safety related systems, systems governed by national codes and standards and other systems as deemed necessary by the Design Authority (DA) or Subject Matter Expert (SME) as appropriate. In some cases, a specific qualification is required for the person who will perform the inspection, and if it exists, should be stated in the work instructions. Each item identified should be shown in the form of a HOLD, WITNESS, or VERIFICATION point. Guidance for developing QC Inspection Plans is provided in PRC-PRO-QA-283, *Control of Inspections (endorsed by PRC).* Since QC personnel are part of the larger QA organization, such a signature block could be labeled as "QA Representative" to allow either QA or QC to sign. If the term “QA Engineer” is used, that would indicate a specific job category.

Radiological Work Planning. The support of the Radiological Control staff should be requested early in the planning process if the task involves work on contaminated or potentially contaminated systems, meets the definition of radiological work, or there is uncertainty if the work meets the definition of radiological work. Specifically, someone who is a qualified Radiological Work Planner must participate in developing the work instructions for all work that is radiological. Depending on the hazards involved, Radiological Work Permits (RWPs), As Low as Reasonably Achievable (ALARA) reviews, and enhanced ALARA reviews may be required. Requirements for radiological work planning can be found in CHPRC-00073, CHPRC *Radiological Control Manual*. Always consider whether to include changing or limiting radiological conditions that are expected during the work, as well as any action levels or RWP void limits. The RWP provides entry, dosimetry, PPE and minimum radiological coverage requirements; any work activity should be part of the work instructions, and not on the RWP. Projects and facilities may have radiological work planning procedures in addition to PRC-PRO-RP-40108 and PRC-PRO-RP-40109; planner should consult the local Radiation Protection office for details.

Rendering Equipment Inoperable. Maintenance activities may make a system inoperable in order to perform the necessary maintenance activity. If the work document will render equipment inoperable during the course of the work, consider whether it is important to state specifically when the equipment becomes inoperable. Such a statement should be placed immediately before the step that renders the equipment inoperable and should also reference the step number where the equipment is returned to an operable state. Consideration may be given to providing a place to record the times that equipment is deactivated and returned to service. This approach should be applied to any critical system or safety basis related work that has an action statement associated with the time the system is in an inoperable condition. (See Nuclear Safety Systems Work above.)

Safeguards and Security. Coordinate work packages that impact security systems with the security group to arrange for proper security coverage during the conduct of the work. Also consider whether these work packages should be marked as controlled information (OUO or UCNI)

Safety Equipment List (SEL). Structures, systems, and components (SSC) which are considered Safety Class and Safety Significant by system are listed on the facility Safety Equipment List (SEL). These items require particular care, use and maintenance attention to ensure safe operation of affected facilities. Each Project or Facility prepares, approves and manages its Safety Equipment List documents are described in PRC-PRO-EN-20050. The DA/TA is responsible to maintain the list and provide technical information to the Planner as applicable.

Safety Precautions. List any unusual safety requirements or hazards just prior to the applicable steps and include actions to take to mitigate personnel injury, radiological exposure, spread of contamination, and exposure to hazardous material, or equipment damage. These should be specified immediately before the applicable work instruction step, and summarized in Section 4.0, Precautions and Limitations. It may be appropriate to utilize warning or caution statements within a box just before the applicable action steps. See also Appendix M.

Scaffolding Use. Access to the work site may require the use of scaffolding. The requirements for the use of scaffolding are provided in PRC-PRO-SH-095, *Scaffolding*.

Signatures in Work Instructions. Few hard criteria exist for when signatures are required to document the completion of specific work instruction steps except for Hold Points per PRC-PRO-QA-5432, or QC inspections per PRC-PRO-QA-283. Some work activities should be tracked with signatures as a good practice, such as those that involve LCO entry/exit or special sequencing of lockout/tagout actions. See Appendix I for formatting suggestions. See also PRC-PRO-WKM-12115, step 3.1.1 for information related to complete records for the purposes of PRC-MP-IRM-40119. Although PRC-PRO-WKM-12115 provides some guidelines for when legible signatures are required, in general, signoffs or initials should only be placed in the work instructions when a checkmark is not good enough for tracking. If a signature is required, then it should meet the criteria of being legible, that is, printed and signed, or electronically signed, or there must be an accompanying signature log. The work planner should consider providing a means in the work document that assists the work team in complying with these directions.

Signs and Postings. Consider including steps in the work instructions to remind the workers when to remove or post signs in proper timing and sequence with the work. Several CH2M HILL programs require signs to be posted under certain conditions. Each program has its own requirements for wording on the signs and for the trigger points when signs should be posted or removed. Each facility that has criticality safety issues will have a program for criticality postings. A summary of accident prevention signs can be found in PRC-RD-SH-29096, *Tags, Signs, and Barriers*. Consider posting requirements for work involving asbestos, beryllium, criticality safety, lead, motor vehicle safety, and radiological controls.

For construction or demolition activities, consult MSC-RD-9717, *Fire Prevention for Construction /Occupancy/Demolition*. This procedure will specify sign and posting requirements for changing conditions, along with other actions that assure personnel safety. See the *Pre-Demolition Checklist* (A-6004-622).

Sketches & Figures. Sketches and figures may be used to help describe the work to be accomplished. They are considered part of the work instructions with appropriate page numbers and with the work package number listed on the sketch or figure. If changes to a sketch or figure in work instructions are required after package approval, use the normal work document change control process. Copies of portions of released drawings may be used as long as the included sections are appropriately page numbered and labeled with the drawing number and work package number to indicate the figure is an actual part of the work instructions. In no case may the configuration of the plant be changed with a figure or sketch. If a discrepancy between plant configurations and the sketch or figure arises, it must be resolved by Engineering before further work is performed.

Sodium System De-Isolation. Work activities on liquid metal systems (e.g., sodium systems at FFTF) require careful melt-out procedures to prevent over-pressurization and potential rupturing of the piping and storage system. Recovery actions include the requirements to provide applicable response procedures. Example: SN-93.15-1, *Operation of the Trace Heat System at FFTF, or any procedure specifically designed to melt out equipment at the Sodium Storage Facility (SSF) at FFTF*.

Support Document Integration. Support documents used in the work package should be reviewed to eliminate conflicts between the work instructions and the support documents. For instance, if sections of a pre-approved procedure are called out in work instructions, but the prerequisites of that procedure cannot be met, it would be better to block and copy the applicable procedure steps into the work instructions than to place the field work team into the position of potentially violating either the procedure or the work instructions. Conflicting information should be corrected before the work package is placed in the review process.

Suspect/Counterfeit Items (S/CI). Consideration should be given to identification of potential installed suspect/counterfeit items during work performance, considering the need for a statement within the work instructions to preclude the use of S/CI. If the work activity involves SSCs that have been determined to be SS, SC or Hoisting and Rigging, there may be requirements for such an inspection. Consult with the DA who has responsibility for the equipment and the local QA Representative to determine whether steps for inspections should be included in the work instructions, and if so, the specific inspection instructions. Suspect/counterfeit items (S/CI) may have been inadvertently installed in structures, systems, components, or other equipment, the failure of which could cause a serious safety hazard to workers or the public. Processes are in place to prevent S/CI procurement, but legacy S/CI will appear during maintenance, decommissioning and disposal operations. When these bolts are identified, they need to be segregated, reported, and then disposed of appropriately and not returned to the parts pool for reuse. It is usually beneficial to plan subsequent verifications prior to field work. Maintenance, modification, and inspection activities present an excellent opportunity to detect and identify any previously installed S/CI. Actions should be included in the work instructions as required for detecting and identifying S/C, particularly when the work involves safety-related structures, systems, or components, or other equipment the failure of which could cause serious safety hazards, actions should be included in the work instructions as required for detecting and identifying S/CI. Refer to PRC-PRO-QA-301, *Control of Suspect/Counterfeit and Defective Items*, for more details.

Tanker Operations. Activities that will involve transportation of liquids via tanker trucks are governed by PRC-PRO-TP-26721, *Tanker Operations*. The procedure outlines requirements for facilities that generate the material, transportation of it, and receipt of the material at a processing facility, as well as calculations, configuration control and maintenance of the tankers, record requirements and operations requirements.

Torque Values. When mechanical fasteners are installed, give consideration to how tight the fasteners must be. Torque values with a tolerance should be clearly identified in the work instructions. These should be obtained from the technical authority for the equipment. Typical applications where torque values are important include piping flanges, valve assembly, and component mounting fixtures such as expanding sleeve anchor bolts. When torque values are required, it is important to carefully specify the type of M&TE to be used and capture the M&TE calibration data. Hold points or Quality Control (QC) witness points might be needed depending on the driver for the torque requirement.

Traffic. Whenever work involves driving to/from the job site or driving as part of the work activity, consideration must be given to the practical aspects of driving itself, as well as traffic patterns, appropriate parking for vehicles and equipment, buffer zones for moving equipment (like counterweights on a mobile crane), proximity to excavations or underground equipment, etc. Work with Safety or a traffic expert to evaluate the potential work site vehicle hazards and determine appropriate controls to be included in the work instructions.

a. Evaluate potential vehicle hazards (i.e.; pedestrian traffic, bollards, "T" posts, debris, poles, material storage, vegetation, etc.).

b. Designate temporary/permanent vehicle and equipment parking location(s).

c. Develop appropriate hazard mitigation controls to be implemented,

d. Identify emergency vehicle access to work site(s).

e. Develop vehicle hazard communication tools appropriate for the job and the hazards, (e.g.; site maps, signs and postings, etc) and include them in the work package; refer to them in the work instructions as appropriate.

f. Consider the hazard of driving to/from the job site, especially for workers who are not drivers by trade.

Troubleshooting. When the exact cause of a problem is not known, steps will need to be included in the work instructions that allow troubleshooting to occur. It is important to provide instructions that are general enough for the trouble shooting to occur without the need for multiple work instruction changes; yet specific enough to prevent undesired secondary effects in the system or the introduction of unanalyzed hazards. The work instructions should include applicable troubleshooting limitations, system restrictions and plant conditions required to cover the work. It is especially important to involve craftsmen, technical authorities, and the system operators in this phase of the work instruction development. Additional guidance on Troubleshooting activities is provided in Appendix G, "Troubleshooting Process Guidance." Where a project has developed a specific troubleshooting guide, it should be followed.

Testing and troubleshooting are limited to those actions necessary to measure voltage and current and to verify the operability of equipment without repairing or replacing components. Troubleshooting activities are controlled by applicable work documents (DOE G 433.1).

For electrical troubleshooting, please refer also to the Electrical Jumper and Wire Installation/Removal for Testing/Troubleshooting section above.

Unresolved Safety Questions (USQ). See Nuclear Safety Systems Work.

Unresolved Safety Questions for Transportation and Packaging (USQ). Provide USQ/CX screenings/determinations to the planner as required by PRC-PRO-NS-062*, Unreviewed Safety Question Process*. See also PRC-PRO-TP-15665, *Transportation Safety Basis Documents*. See also Nuclear Safety Systems Work.

Water Systems. See MSC-PRO-27075, *Hanford Site Public Water System Tie-In*, for guidance and requirements for connecting to a Hanford Site Public water system. This procedure covers the raw and potable water distribution systems. Water tie-in will require the use of a *Request for Water Service Tie-In* (A-6004-007), and the Hanford Water Purveyor must approve all documents associated with work on water systems. Rule of thumb is that any time the work activity includes breaching the boundary of an existing water system or constructs a new one, contact the Water Purveyor for guidance on the requirements, hazards and controls associated with that work.

Waste Planning and Avoidance. Hazardous waste may be generated during the conduct of maintenance activities. The waste may be from materials introduced during the conduct of the maintenance activity, result from replacement of damaged equipment, decontamination & decommissioning, or a variety of other reasons. The handling of the hazardous waste must be planned for in advance of the work activity so that the facility will stay in compliance with applicable orders. PRC-PRO-EP-15333, *Environmental Protection Processes*, includes processes to ensure for proper waste generation planning, handling, and disposition. Involvement of the environmental Subject Matter Expert (SME) for the work group is necessary to gain the proper technical input on current requirements so they can be implemented in the work instructions. Some projects have developed waste planning checklists to facilitate this planning process. Examples include *CHPRC Waste Planning Checklist* (A-6004-964), Waste & Fuels Management Project (W&FMP) *Waste Planning Checklist* (A-6004-590), and *Waste Planning Checklist – KBCP* (A-6003-587). As the Projects transition to D&D, they should be including Waste Planning Checklists more and more during development of work instructions.

Regulated hazardous material includes hazardous waste and hazardous substances as defined in Title 49, *Code of Federal Regulations*, Part 171.8, (49 CFR 171.8), radioactive material as described in Title 49, *Code of Federal Regulations*, Part 173.403, (49 CFR 173.403) and regulated samples sent for testing and/or analysis. Movement of regulated hazardous materials and waste onsite is conducted in accordance with PRC-PRO-TP-156, *Onsite Hazardous Material Shipments*. Transporting regulated hazardous material off the Hanford Site is conducted in accordance with PRC-PRO-TP-157, *Offsite Hazardous Material Shipments*, when transportation meets the definition of offsite contained in PRC-RD-TP-7900, *Transportation and Packaging Program Requirements.*

It is important to minimize the generation of radiological, hazardous and mixed waste. Consideration should be given during the planning process to what can be done to avoid producing any excess waste during the work activity. Consideration should be given to including in the Precautions & Limitations section a general statement such as: *"FWS ensure that waste minimization techniques are employed. Dispose of as much incidental waste (packaging, material, dunnage, blocks, boxes, etc.) as possible prior to taking equipment/parts/material into any Contamination Areas. Restrict the amount of miscellaneous materials to the amount required to complete the job."*

Welding. If welding is involved in the work, refer to PRC-RD-WLD-23775, *Administrative Control of Welding,* for appropriate requirements and controls. You must also consider the hazards of various vapors created during welding and similar activities such as torch-cutting and grinding. To control hexavalent chromium, consult PRC-PRO-SH-31697, *Controlling Exposures to Hexavalent Chromium.*

Forms

CHPRC Asbestos Work Permit (A-6004-747)
CHPRC Confined Space Entry Log (A-6004-726)
CHPRC Confined Space Entry Permit (A-6004-724)
CHPRC Electric Jumper Installation/Removal Record (A-6004-958)
CHPRC Energized Electrical Work Permit (A-6004-799)
CHPRC Hanford Site Excavation Permit (A-6004-751)
CHPRC Hazard Review Board Meeting Record (A-6004-513)
CHPRC Hotwork Permit (A-6004-725)
CHPRC Lifted/Landed Lead Record (A-6004-960)
CHPRC Modification Impact Review (A-6004-963)
CHPRC Nonemergency Hydrant Tie-In Permit (A-6005-120)
CHPRC Pre-Job Briefing Checklist (A-6004-952)
CHPRC Radiological Hazard Screening Form (A-6004-654)
CHPRC Radiological Work Permit and *Addendum* (A-6004-602 and -603, respectively)
CHPRC Test Signature/Initials (A-6004-926)
Modification Impact Review (A-6004-963)
Nonemergency Hydrant Tie-In Permit (A-6003-681)
Request for Water Service Tie-In (A-6004-007)
Waste Planning Checklists:

- *CHPRC Waste Planning Checklist* (A-6004-964)
- *Waste Planning Checklist – KBCP* (A-6003-587)
- *W&FMP Waste Planning Checklist* [W&FMP] (A-6004-590)

Worksite Hazard Analysis For Skill-Based Work (A-6004-539)
Work Package Engineering (WPE) Coversheet (A-6005-105)

References

29 CFR 1926.32, *General Safety and Health Provisions*

49 CFR 171.8, *General Information, Regulations, and Definitions* [*Pipeline and Hazardous Materials Safety Administration, Department of Transportation*]

49 CFR 173.403, *Shippers--General Requirements for Shipments and Packagings*

ANSI EIA-649-1998, *National Consensus Standard for Configuration Management*

DOE-RL-92-36, *Hanford Hoisting and Rigging Manual*

DOE-STD-1029-92, *Writer's Guide for Technical Procedures*

FSP-PFP-0821, *Chapter 10, Independent Verification*

MSC-PRO-27075, *Hanford Site Public Water System Tie-In*

MSC-PRO-478, *Electric Service Request*

MSC-RD-8589, *Hanford Fire Marshal Permits*HNF-RD-9390, *Fire Hazard Analysis Requirements*

MSC-RD-9717, *Fire Prevention for Construction/Occupancy/Demolition Activities*

MSC-RD-9900, *Hot Work Performance Requirements*

PRC-PRO-QA-301, *Control of Suspect/Counterfeit and Defective Items*

PRC-PRO-QA-33415, *Structures, Systems, Components Cleaning/Cleanliness and Foreign Material Exclusion*

PRC-PRO-QA-5432, *Hold Point Application in Technical Work Documents*

PRC-PRO-SH-095, *Scaffolding*

PRC-PRO-SH-121, *Heat Stress Control*

PRC-PRO-SH-31697, *Controlling Exposures to Hexavalent Chromium*

PRC-PRO-SH-6155, *Chronic Beryllium Disease Prevention Program (CBDPP)*

PRC-PRO-TP-156, *Onsite Hazardous Material Shipments*

PRC-PRO-TP-157, *Offsite Hazardous Material Shipments*

PRC-PRO-TP-15665, *Transportation Safety Basis Documents*

PRC-RD-EN-19440, *Design, Inspection, Testing and Repair of ASME-Coded Pressure Systems and Safety Relief Valves*

PRC-RD-PMT-11408, *Property Management Requirements*

PRC-RD-SH-24243, *Portable Ladders*

PRC-RD-SH-28954, *Equipment Operations near Overhead Electrical Lines*

PRC-RD-SH-8801, *Fall Protection*

PRC-RD-SH-9237, *Motor Vehicle/Bicycle Safety*

PRC-RD-TP-7900, *Transportation and Packaging Program Requirements*

PRC-RD-WLD-23775, *Administrative Control of Welding*

Appendix E - intentionally deleted

Appendix F - Work Package Workability Review Guide

Performance of a final workability review by FWS and crafts is recommended, especially for complex work activities. A form similar to the one below may be used to conduct workability reviews.

Work Package #: _____

Planner:_____ Phone: _____

1. Technical Work Instructions

    a. Ensure the scope is clearly stated and that the instructions accomplish no more or no less.
    b. Ensure actions that must occur prior to authorization by the Release Authority are stated in the Prerequisites section.
    c. Ensure steps are appropriate and can be performed safely.
    d. Ensure steps are sequenced as required or provide flexibility if sequencing is not essential for safe performance.

        1) If flexibility is allowed, appropriate constraints, conditions or boundaries have been included so that it is clear to the work team what steps may or may not be done out of order, skipped, or re-perform.
        2) If the work will cause safety basis issues such as LCO entry/exit, ensure these points are clearly stated so the work team and the Release Authority have a common understanding.

    e. Ensure the instructions can be performed efficiently as written, considering the required technical sequence and safety aspects.
    f. Verify that previous lessons learned have been incorporated.
    g. Ensure any critical steps have been identified, and that actions to mitigate “what could go wrong” have been included in the instructions.

2. Appropriate post-maintenance testing and acceptance criteria have been specified.

3. Hazard Analysis is completed and accurate.

    a. Review formal Automated Job Hazard Analysis (AJHA) to ensure hazards have been adequately analyzed and appropriate controls have been specified in the work instructions.

    b. If no formal AJHA was performed, verify that work is “skill-based.”

4. Review Lock Out/Tag Out Requirements/Reference.

    a. If lockout/tagout will be implemented for this activity, verify the following points are stated in the work instructions:

        1) LOTO will be used, and by what means (AWL or TAF)
        2) The specific hazards will be controlled by the LOTO

b. If no LOTO is needed for this work, verify that fact is clearly stated, along with supporting information if the workers in the field might question this decision (e.g., no exposed electrical of > 50 volts within the work area, etc.)

5. Verify waste minimization and waste disposal are properly addressed.
6. Completeness/Accuracy of Support Drawings, sketches, photos, etc.
7. Verify correct material is called out on the electronic Bill of Material.
8. Required tools, equipment (including M&TE) and materials are verified available to perform the work, or will be available when the work is scheduled for field work.

Based on the above review criteria, determine if work package is workable as written. If problems are found during the review, record below and return the work package to the FWS for submittal to Planning.

Comments/Problems Identified & Resolution:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Comments Submitted by :_____

FWS involved in review: _____

Workers involved in workability review: _____

If additional space is needed, use reverse side of form.

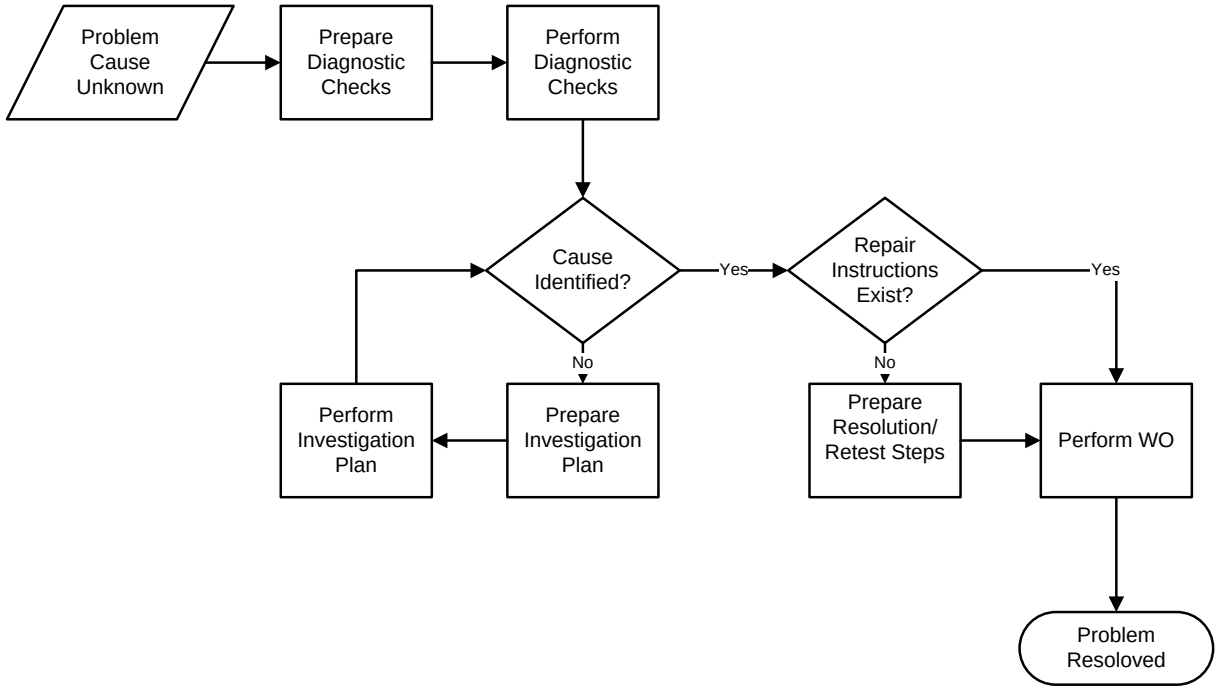
Appendix G - Troubleshooting Process Guidance

Additional information can be found within the JCS web page.

Trouble shooting is required when a problem cause is unknown. Trouble shooting needs to be approached with caution. Obtaining basic diagnostic information can be straight forward. More extensive trouble shooting plans must be tailored to the equipment and the condition being investigated. Care must be exercised to ensure that energy sources are respected and that system configuration is understood and maintained at all times during the process.

Figure G-1 lays out the work flow for a general trouble shooting approach

Figure G-1- Basic Trouble Shooting Flow Path



Diagnostic Checks (non-invasive). The first step in any trouble shooting process is to obtain diagnostic information about the condition.

NOTE: *For electrical troubleshooting, compliance with PRC-RD-SH-11827 for energized electrical work is required. This includes shock and arc flash analysis, PPE, and justification for energized work if the troubleshooting could be accomplished with the equipment de-energized.*

Diagnostic checks include:

- Simple observation of equipment performance in its current operating condition.
- Visual observation of system/component, existing installed instrumentation, and control panel indications, etc. while equipment operation is changed in accordance with existing operating procedures.
- Take voltage, current (clamp-on ammeter), and resistance readings on electrical circuits without removing components
- Take vibration readings.
- Take temperature readings on system/equipment externals.

- Apply an approved leak detection fluid to pressurized piping/tubing systems.
- Use refrigeration test gauges on test taps.
- Other checks that do not change the configuration of the equipment and are skilled based activities.
- If equipment is inoperable, obtain reports of equipment performance prior to being inoperable.

It is acceptable to prepare No Additional Planning Required (NPR) work documents that contain instructions for obtaining diagnostic information if you can meet all the requirements for NPR documents stated in PRC-PRO-WKM-12115, Appendix E, Table B. For each use of the work document, it is important that the scope and limitations of the diagnostic checks to be performed are clearly stated by the technical authority and understood by the facility owner and the investigation team. Work instructions for troubleshooting need to be assessed by the facility owner each time they are used. Operations release may be required, depending on the situation. During performance it is important to document the results and stay within the bounds approved in the plan.

Outcomes. A successful outcome of the diagnostic checks is that the cause of the problem is identified. The repair instructions may have been anticipated and included in the original work document for the diagnostic checks. If so, once the work package is properly released, the work team can resolve the problem using these instructions. Electrical troubleshooting is allowed while components are energized under certain conditions; repair of the same systems are not allowed to be performed while the components are energized under most circumstances. If repair and retest instructions do not exist or are not adequate, a new work package should be processed to resolve the problem.

Invasive Troubleshooting. If the cause was not identified, a more detailed investigation will be needed. The investigation may require non-standard system operation, opening of system boundaries to determine internal system conditions, lifting multiple electrical leads to take special voltage, amperage or resistance readings not otherwise available, or other intrusive (invasive) checks that alter normal system configuration. These activities require a more disciplined approach, using work instructions to ensure system configuration will be properly restored at the completion of troubleshooting and/or repair activities. One tool used to help manage electrical/electronic equipment configuration is the *CHPRC Lifted/Landed Lead Record* (A-6004-960). A new planned and approved work document will be required if a NPR style work document was used for the diagnostic checks and the repair work goes beyond that allowed for Minor Work Request or NPR work as defined in PRC-PRO-WKM-12115, Appendix E.

Transition from Troubleshooting to Repair Mode. The transition from troubleshooting into actual repair can be a challenge to field personnel. The natural tendency is to jump right in and repair the deficient condition once the cause is known. If the work instructions do not allow the repair, and field personnel make the repair, a work management error has occurred. Similarly, if the work instructions contain repair instructions that are too general, the repair may proceed before a solid understanding of the impact of the work is understood. Generally it is a good practice to pause after identifying the cause of the problem, share it with the technical authority and operations entity or facility owner, as appropriate, and then determine a path forward. If the work instructions contain only troubleshooting scope, the pause is inherent in the process as new instructions to act upon the results of troubleshooting are developed and approved. When the work document contains a combined trouble shoot and repair scope, then the work instructions should clearly identify where the transition takes place and include provisions for the pause/notifications/release to occur.

Appendix H - Enhanced Work Planning Guidance

The goal of the Enhanced Work Planning (EWP) process is to ensure that work is performed safely, correctly (from both technical and regulatory perspectives), and efficiently. The EWP process involves the bringing together of the various field workers, regulatory and support functions, technical authority and supervision into the work planning function. For complex work, it is important to invoke the EWP process as early in the planning effort as possible – this will help define the scope and sequence of work and facilitate the understanding of the work by all parties involved. It is typically the person doing work planning that is responsible for ensuring that the EWP process and goals are met.

EWP Team Assembly -The graded approach to work planning applies equally to the EWP process in determining the total extent and nature of the process that is applied.

Per PRC-PRO-WKM-12115, Appendix L, "Review and Approval of Work Management Documents," the Technical Authority (aka, Design Authority or Cognizant Engineer) for a given SSC is responsible for determining who needs to be involved in review and approval of a work document. While this covers the regulatory driven aspects of work, it doesn't address field workers. It is important to get representatives of each craft or field worker group and the assigned Field Work Supervisor (FWS) involved in the process as well. Therefore, it is important to understand what work groups need to be involved. Because the FWS will normally be the best person for determining this, it is important to find out early on who the assigned FWS will be, if possible.

Preparing an Initial Work Outline or Draft Work Instructions. Using previously prepared work instructions is the best starting point when the work will be the same or similar to work that has previously been performed.

Projects and facilities utilize a variety of means of retaining previous work instructions – contact a person in authority within the work management group to determine the best way to research these for the facility of interest.

In the absence of previous work instructions, the Technical Authority and/or FWS are typically excellent resources to provide the basic outline and draft work instruction content. It may be necessary to contact regulatory or other support groups during the initial drafting to fold in specific requirements and to initiate the process for any required permits.

When work is routine and non-complex, it may not be necessary to go beyond individual meetings/input to complete development of work instructions. Care should be taken if this approach is used that the advantages of group interaction are not lost.

Group EWP Sessions. When work is beyond routine (complex and/or hazardous), it is useful to gather the participants identified above into a group meeting to work out the details of the work instructions. A group setting is useful for sharing perspectives which leads to increased understanding, better controls of hazards, and more efficient and effective solutions. It should always be policy, and adhered to as much as possible, to have individuals who will actually be performing work in the field as participants in any EWP group sessions. If it is not possible to have the actual field workers present, a representative of their craft/function should be there and the actual field workers should still have the opportunity to review the instructions prior to finalization. More than one group session may be necessary to resolve highly complex work or where substantial questions or concerns arise that cannot be dealt with during the original session. These planning or scoping meetings are vital prior to conducting hazards analysis.

The work scope must be well understood before the hazards can be completely identified, but it is understood that this may be an iterative process as the planning progresses.

Preparing for Group Sessions. It is important to be prepared to be a good facilitator for a group EWP session. This means considering the following list of preparation points:

- Provide adequate notification to attendees and their supervisors of the scheduled session (a week ahead is best) and any revisions to the meeting time or place.
- Use the "Plan of the Week," if available, to schedule the session and required attendees, especially craft resources.
- Send out draft work instructions and any other pertinent information to participants for their review in advance of the session, include any special instruction (e.g., requesting their attention to a particular area that needs resolution).
- Arrange a location suitable for the session, with adequate seating, minimal distractions, etc.
- Consider use of an overhead projector and laptop to display information pertinent to the work (draft work instructions, drawings/sketches, photos of work site, etc.).
- Ensure sufficient hard copies of any materials that will be reviewed during the session are available for all participants.
- Ensure a participation roster is available and completed.

Facilitating the Session. The EWP session facilitator is responsible for ensuring that all participants have a chance to make their comments known and that those comments are appropriately addressed individually or by the group. The facilitator must also keep the meeting flowing to ensure the entire work scope is addressed. If the session gets bogged down on a particular issue, the facilitator should table the issue for a subsequent meeting, possibly only including those attendees that are interested in it. A follow-on EWP session should be held if the entire work scope, and especially hazards and controls, is not addressed or if there is a need for group follow-up. For truly complex jobs it may be necessary to schedule several meetings to complete the scoping and hazards analysis for the work activity.

Follow-Up on Questions and Concerns. During an EWP group session, someone needs to have the responsibility to record comments related to the work instructions. While this is typically the person doing the work planning and leading the EWP session, the facilitator consider assigning another participant to serve as the recorder for the meeting. This approach will assure that for discussions of highly complex work activities that the meeting progresses smoothly and that valuable comments are not missed. There should always be follow-up when there is an unresolved question or concern during an EWP session. A good practice is to document comments and how they were resolved. A systematic approach to handling of comments will facilitate the subsequent approval process. Follow-up may be addressed to one or more individuals or to the entire group, as appropriate.

Control of Known or Potential Hazards and AJHA Development. It is tempting to hold the AJHA session concurrently with the initial planning session, but there are several factors that should be considered. First, the work instructions need to be sufficiently developed to allow completion of the AJHA and this may not be the case early in the planning process. Secondly, participants should be encouraged to discuss the job with their peers to help develop a broader base of understanding regarding the job because 1) continuity of the work team throughout work planning and execution is often problematic and 2) peers will often have valuable experiences or perspectives to contribute. As long as these considerations are taken into account, the AJHA development session may be held concurrently with an EWP session later in the planning process since most participants will be the same and because identification and control of hazards is an essential element of the overall work plan.

Identification of known or potential hazards, including how and under what circumstances they may change (and thereby also affect Precautions & Limitations), and what controls will be implemented to minimize the risk to workers to As Low as Reasonably Achievable is a critical element of successful work planning. The overall process of analysis and control contained in PRC-PRO-WKM-079 should be followed. It is reemphasized here that, barring other considerations, controls should be applied in the preferred order of: 1) engineering controls, 2) administrative controls, and 3) personal controls (i.e., personal protective equipment [PPE]). It is important to recognize that the application of some controls (e.g., lockout/tagout, use of PPE, erection of scaffolding, etc.) may, in some cases, introduce new hazards or risks and may affect decisions about what controls to apply or how best to apply them. This complex integration and balancing of risks is critical to the overall success of the EWP and AJHA processes.

Changes During Work Review and Approval. If during work review and approval significant changes are made to work instructions, particularly changes that may affect hazard analysis and controls the planner shall at a minimum inform the EWP participants of the changes.

Appendix I - Examples of Hold Points and Other Signature Fields

This appendix is intended to provide general examples that may be used to format various signature-required steps within work instructions. Generally, the beginning of the step should indicate in parentheses if it is a (HOLD), (WITNESS), (VERIFICATION), etc. type of step. The requirements specified in PRC-PRO-QA-5432, *Hold Point Application in Technical Work Documents*, PRC-PRO-QA-283, *Control of Inspections*, and PRC-PRO-EN-286, *Testing of Equipment and Systems*, should be consulted to determine when and how hold points and other signature control points should be applied.

Inspection Points. When requesting QC inspections ensure description of work is called out complete with special codes, forms, etc, (e.g., American Society of Mechanical Engineers [ASME], National Electrical Code [NEC], Atomics International [AI]) and formatted similarly to figures below.

QC Inspection Points. See example step in Figure I-1 used for QC Witness or Verification steps.

NOTE*: **For construction packages**: A Notification should be provided for the Test Engineer in conjunction with **QC/AI** for **all** Construction Acceptance Tests (e.g., elect. terminations, meggering (480 volts only) and continuity, ground checks, mechanical flush and hydro, etc.), and a separate verification line should be added.*

Figure I-1 - Example for QC Steps 1

7.4 **(WITNESS)** Install concrete expansion anchors/bolts as indicated in drawing

H-1-83699, sheet 2 for the Booster Pump Skid and per *(insert specific procedure or test that contains specific criteria or process)***.** Adhere to Controls in Step 6.0 for drilling.

(QC action statement) QC witness concrete anchor installation and document as required.

_____/_____/____/____/____

QC Representative - signature/print name/Date

_____/_____/____/____/____

Test Engineer- signature/print name/Date

_____/_____/____/____/____

FWS/Construction Super/Foreman/signature/print name/Date

Acceptance Inspections (AI). See example step in Figure I-2. Acceptance Inspections should be provided by AI Representatives and hold points included as shown in Figure I-2. If AI and QC inspection points are required in the same step, add both in the left margin and another verification signature line. AI/QC action statement should be located in this space if needed.

NOTE: ***For Construction packages****: Whenever AI testing or NEC inspection activities apply to a work package, the Test Engineer should be notified to witness any and all tests or NEC inspections in conjunction with AI, and a separate verification line should be added*

Figure I-2 - Combined Inspection/Witness

NOTE: *Prior to performing test, QC will verify that all required fabrication and installation records are complete.*

7.4 (**WITNESS)** Perform flush and hydro testing of 2" Water Pipe per **xxx.**

AI/QC ***(AI/QC action statement)*** AI/QC to witness flush and hydro test and document results on Pressure Test Certification (insert specific document here. Document must clear state criteria for test).

_____/_____/_____/___/____

AI Representative signature/print name/Date

_____/_____/_____/___/____

QC Representative signature/print name/Date

_____/_____/_____/___/____

Test Engineer signature/print name/Date

_____/_____/_____/___/____

FWS/Construction Super/Foreman/signature/print name/Date

For any work package containing Acceptance Test (AT) or Component Test Package (CTP) requirements, a step should be added to the work instructions similar to the one shown in Figure I-3.

Figure I-3 - Acceptance Test Example

7.4 Start-up and AI to verify all Component Test Package (CTP) have been completed and accepted prior to closure of the work package.

_____/_____/_____/___/____
Test Engineer - signature/print name/Date

_____/_____/_____/___/____
AI Representative - signature/print name/Date

_____/_____/_____/___/____
FWS/Construction Super/Foreman - signature/print name/Date

All work packages that require Acceptance Tests added after the work package is approved should be modified to add the Testing Notifications.

HP Hold Points. See example in Figure I-4. HP hold points should be provided by Radiological Control ALARA Planning Staff as required by CHPRC-00073.

It is recommended that a Note similar to the one below be inserted before each HP Hold point in the work package.

***NOTE**: FWS or designee will be present during all HP Hold points to ensure step completion.*

HP hold points should be designated by placement of parenthesis around the HP flag in the left margin. Hold points should include space for radiological control personnel to print name, sign and date. Requirements associated with Hold Points are found in PRC-PRO-QA-5432.

Figure I-4 - Example Hold Point Steps

NOTE: FWS or designee will be present during all HP Hold points to ensure step completion.

7.4 **(HOLD)** Set-up a glove bag on valve IXCV-70 and install a flange equipped with fitting and hose on the downstream side of valve to facilitate system flushing into Basin.

(HP) HP to certify glove bag per Controls set in Step 6.4.

_____/_____/_____/___/____
HP Representative - signature/print name/ Date

_____/_____/____/____/____

FWS/Construction Super/Foreman - signature/print name/Date

Appendix J - intentionally deleted

Appendix J has been intentionally deleted from revision 0, change 0.

Appendix K - Work Instructions Template Example

The work instruction outline provided here is recommended to be used as a template. Sections with an asterisk are always required. It is better to use a section heading and write in N/A or "none" if there is no information for a header than to delete it. Section 7 may be modified for very simple retests.

1. ***SCOPE**

Provide a clear description of the purpose and scope of this set of work instructions.

2. **REFERENCES**

- See Reference Documents Section of Work Document.
- Permits, Reports & Special Procedures

3. **MATERIALS, SPECIAL TOOLS & EQUIPMENT**

Refer to eBOM as applicable.

List special equipment not normally used by Craft (i.e., crane, man lift, calibrated tools etc.

4. **PRECAUTIONS AND LIMITATIONS**

Specify precautions that affect the entire procedure or that occur at more than one point in the procedure. Be sure this section corresponds to hazard controls identified in AJHA that apply throughout the work scope.

Limitations may include weather, radiological conditions, other circumstances under which the work may no longer proceed, or under which additional controls must be imposed.

Precautions, limitations, and associated radiological controls that are not specified on the RWP should be included here. Examples include local ventilation, glove bag, or other engineering controls, air sampling requirements, hold points, etc.

5. ***PREREQUISITES**

- Identify actions that must be completed by the user and requirements that must be met and signed off before the user continues with the INSTRUCTIONS.
- Prerequisites and initial conditions should be detailed. Prerequisites describe initial conditions that the Release Authority must verify prior to authorizing field work to proceed. The RA must verify that actions related to plant configuration and other Operations responsibilities are satisfied prior to releasing the work, but all activities that must take place prior to work beginning should be in this section. Clearly group or individually identify the actions in this section by those that are the responsibility of the RA and those that are the responsibility of the FWS and Work Team. The prerequisites include items such as facility configuration, equipment line-up, conditions related to facility safety basis, staging of equipment, scaffolding, etc
- If unacceptable risks may be introduced if work were to proceed without accomplishment of all Prerequisites, then provide a signoff indicating that verifying that Prerequisites have been verified complete prior to work release by Release Authority.

6. ***WORK STEPS**

a. use the format 6.1

or use the format 6.1.1, or 6.1.a

or continue the alternate format of 6.1.2 or 6.1.b

b. or continue alternate format 6.2, etc.

WARNING

WARNINGS ALERT USERS TO POTENTIAL HAZARDS TO PERSONNEL

IF WARNING APPLIES TO ENTIRE PACKAGE, THEN IT CAN BE ADDRESSED IN PRECAUTIONS AND LIMITATION. OTHERWISE, POSITION WARNING AND CAUTIONS SO THEY ARE COMPLETE ON ONE PAGE AND APPEAR IMMEDIATELY BEFORE AND ON THE SAME PAGE AS THE ACTION STEP(S) TO WHICH THEY APPLY.

CAUTION

CAUTIONS ALERT USERS TO POTENTIAL HAZARD TO PRODUCTS OR EQUIPMENT.

WHEN WARNING AND CAUTIONS ARE USED TOGETHER, CAUTIONS FOLLOW WARNINGS.

***NOTE**:* Use notes to present information that assists the user in making decisions or improving task performance.

1) Position notes so they are complete on one page and appear immediately before and on the same page as the action step(s) to which they apply.
2) Place warnings and cautions ahead of notes whenever more than one type is used at the same point in a procedure.
3) Do not include action steps in notes.
4) Number the notes if more than one note is entered at the same location in a section or subsection.
5) Write text in *italics*.

7. **RESTORATION & TESTING**

7.1 PURPOSE:

Describe restoration and/or testing work to be accomplished. For D&D work, summarize the “as left” condition of systems, equipment or site.

7.2 PRECAUTIONS AND LIMITATIONS

List here any precautions or limitations that apply to system restoration or testing.

7.3 PREREQUISITES FOR RESTORATION

7.3.1 Identify actions that must be completed by the user and requirements that must be met and signed off before the user continues with Restoration and Testing.

7.3.2 For modification work, a walk-down by the Design Authority is recommended.

7.3.3 Include verification signoff(s) as appropriate.

*7.4 *RESTORATION & TESTING WORK STEPS*

7.4.1 List restoration and testing steps here, including acceptance criteria as appropriate.

7.4.2 For D&D work, summarize the "as left" conditions of the site, equipment, or system.

7.4.3 Be sure to include work site housekeeping, return of unused materials, proper disposal of waste, etc.

8. STARTUP ACTIVITIES & TURNOVER

8.1 Include here those items necessary to satisfy construction start-up testing, to document work completion and operational acceptance, including reference to checklists or other pre-turnover activities that must be accomplished. For Modification work, the Modification Impact Review form should be reviewed to ensure all items required to be completed prior to placing SSC into service have in fact been completed. Include signoffs as appropriate.

8.2 FWS (PIC, Construction Superintendent, etc.) to verify work is complete, properly documented, and SSC is ready to turnover to Operations/owner.

8.3 Technical Authority (Design Authority, System Engineer, etc.) to review for deficiencies that may preclude acceptance or require follow-up actions and accept work performed.

8.4 Operations/owner to review and concur that work is complete and accept transfer of responsibility for SSC.

8.5 Return or close all permits, forms, checklists, and reports to the appropriate organization or department.

Appendix L - intentionally deleted

Appendix L has been intentionally Deleted from Revision 0, Change 0

Appendix M - Incorporating Hazard Controls into Work Instructions

The term “skill-based” used in this appendix is defined in PRC-PRO-WKM-079, *Job Hazard Analysis*.

These guidelines may be applied in the absence of clear direction from higher tier documents in the PRC system. In the event of a conflict, the RD or PRO must always be given preference over this GUIDE.

1. Perform Hazard Analysis. Planners collect the hazard and controls that have been identified through established hazard analysis mechanisms, and then apply these guidelines to determine which controls should be incorporated into the work instructions and how. The most common source of hazard controls is from the Job Hazard Analysis performed per PRC-PRO-WKM-079 via the Automated Job Hazard Analysis (AJHA), but controls at some Projects could also be directed from other safety basis documents that are not addressed by the AJHA. These could include:

- Baseline Hazard Assessment (BHA)
- Health and Safety Plan (HASP)
- Technical Specification Requirements (TSR) and/or Administrative Controls (AC)
- Site notifications concerning traffic detours or road closures, weed burning schedules, or pesticide spraying, etc.
- AJHA performed by another group, such as Construction or Safeguards & Security

2. Skill-based, normally used. Hazard controls within the qualification or training of the worker (skill-based) that are normally utilized in the performance of work do not need to be discussed in the work instructions. Hazard controls of this nature are not required to be included in the work package. Examples:

- OSHA requirements applicable to normal journeyman craft certification and duties
- Facility-specific training for work that is routine at that location (e.g., VE, fuel handler)
- Scaffold use, work on elevated platforms
- Ladder use (assuming normal ladder use, not an engineered or special application)
- Fall protection (if the equipment is routinely used at that facility)
- Forklift/aerial lift work for routine activities (except unusual loads or configurations)
- Routine hoisting and rigging activities (not critical lifts)
- Hazard controls that are part of HGET
- Non-permit Confined Space (NPCS) entries where this is routinely done (at least one/month)
- Routine radiological controls for work that has been screened as low radiological risk

3. Skill-based, seldom used. Hazard controls within the qualification or training of the worker (skill-based) but are *seldom utilized (*< 3/year) *and are applicable to the entire work activity* should be placed in the Precautions as a reminder that the hazard exists and that the workers are expected to take the appropriate actions. Examples:

- Energized electrical work
- Electrical or other work that requires coordination with Electric Utilities or BPA
- Facility outages or large system outages of the kind that are rarely done or require detailed coordination among many workers
- Wire pulls from hot cells (pulling wire from highly contaminated area into a clean area)
- Filter bank change-outs using glove bags
- Confined space entries at facilities where they are not done routinely, but the hazards are of the type routinely seen by the workers
- Using cut-resistant gloves when there is a likelihood of handling sharp objects
- Identify minimum radiological coverage and action levels to support the planned work

4. Skill-based, introduced at a specific step in a large work package. Hazard controls within the qualification and training of the workers (skill-based) but are for *hazards that are introduced at specific work instruction steps or by specific actions* during the job should have a warning statement immediately prior to the work instruction step but require no detailed instructions to mitigate the hazard.

NOTE: *Work requiring these kinds of controls should be performed on a MWT or as No Planning Required (NPR) work only if all the criteria for that type of work can be met, the hazard control is written on the work order or Worksite Hazard Analysis For Skill-Based Work (A-6004-539), and the FWS covers the control during the pre-job briefing. Action statements are not allowed in caution or warning statements.*

- Blind penetration work and excavations should have a warning related to concealed piping, equipment or conduit that could be encountered.
- Shear or excavator operations at a D&D work site.

Ladder use (assuming normal ladder use per PRC-RD-SH-24243, not an engineered or special application.

- Fall protection, especially if it is unusual, such as in locations that do not have engineered safety features installed and thus require a spotter to be on location during the work.
- PPE that applies at only certain work steps, such as special chemical goggles, voltage-rated gloves and face shield, etc.
- Warnings for work involving specific hazards such as lead or asbestos
- Warnings for work steps that require specific radiological monitoring, actions to reduce total dose or potential spread for contamination, etc.

5. Beyond skill-based, need details. Hazard controls not within the qualification and training of the workers for hazards (beyond skill-based) should have detailed steps incorporated into the work instructions for how the workers are to mitigate the hazard and should be placed in the work instructions in such a way that serves to prevent or mitigate the hazard. Consider these steps as "critical steps" - those steps, series of steps, or actions that, if performed improperly, will cause irreversible harm to plant equipment or people or significantly impact plant operation. Follow HPI methodology to consider what could go wrong during these steps and ensure the work instructions provide appropriate controls. See HPI in Appendix D. Examples:

- Rad con action values that are below void limits.
- Radiological void limits related to the work (and consider referring to procedure steps that contain immediate actions in the event void limits are exceeded).
- Work screened as medium or high radiological risk for which specific and prescribed protective measures must be followed to reduce total dose or the spread of radioactive contamination.
- Controls for shipping materials (e.g., certain rad limits per container).
- Hazardous energy controls (lockout/tagout) that must be implemented in a step-wise fashion in order to conduct an adequate safe condition check per DOE-0336, or LOTO boundaries that must be changed during the work.
- Hazards associated with new equipment may need to have the controls in the work instructions for start-up and acceptance testing. This could also apply for rented or borrowed equipment of a type that is not normally used by the workers.
- Controls associated with use of a new chemical in the work place.
- Emergency response plans that differ from normal responses.
- Work steps that require "listeners" to hear EP alarms and warn the work team (this normally applies in high noise areas, or where noisy equipment will be in use to accomplish the work).
- Excavation when it requires that the dig site be adequately sloped prior to entry or the use of a shoring box. A step in the work instructions to have the Competent Person verify that the dig site is safe for entry would be appropriate.
- Entry into a Permitted Confined Space where the IH must monitor the space prior to entry and provide these results to the craft and supervisor(s) prior to work. A step should be in the work instructions directing that this be accomplished prior to entry.
- Confined space entries where the hazards are not routinely encountered by the workers.
- Special alarm responses beyond HGET training.
- Safety watch on roof tops, near trenches, or similar circumstance.

6. LOTO required for the job. Hazardous energy controls (lockout/tagout) should be mentioned whenever hazardous energy boundaries apply, regardless of whether or not the work has been determined to be skill-based. A good practice is to include a statement in the precautions and limitations that hazardous energy control is required for the work, and provide a step to verify that the hazardous energy boundary has been applied per DOE-0336.